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INDUSTRIAL MEDICINE

Industrial Health, Occupational Medicine and Traumatic Surgery

April, 1947

Vitamin Supplement
— Effects on Groups of Steel Workers —

Medical Departments in Small Plants
— Layout, Equipment, Cost —

Chemical Eye Injuries
— First Aid —

Peptic Ulcers
— Surgical Management in Railway Employees —

Acute Head Injuries
— Diagnosis and Management —

Systematizing Accident Investigation
— Under Medical Direction —

The Post-cholecystectomy Syndrome
— Analysis: Treatment —

Relation of Nutrition to Dental Caries
— Present Knowledge —

Mass Immunization for A & B Influenza
— In an Industrial Plant —

Volume 16 Number 4

New Names for

Iodine Tinctures

Effective April 1, 1947, the following names become official in United States Pharmacopoeia XIII and National Formulary VIII:

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[Official in U.S.P. XII as Mild Tincture of Iodine]

Formula

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Sodium Iodide	24 Gm.
Diluted Alcohol, a sufficient quantity, To make	1000 cc.

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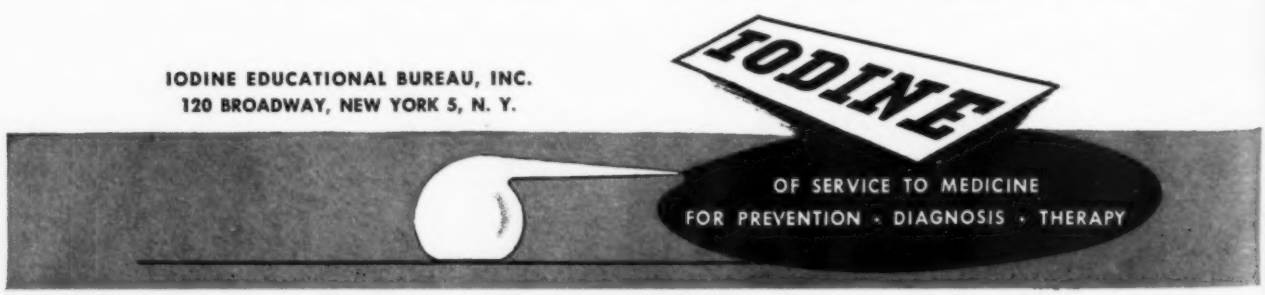

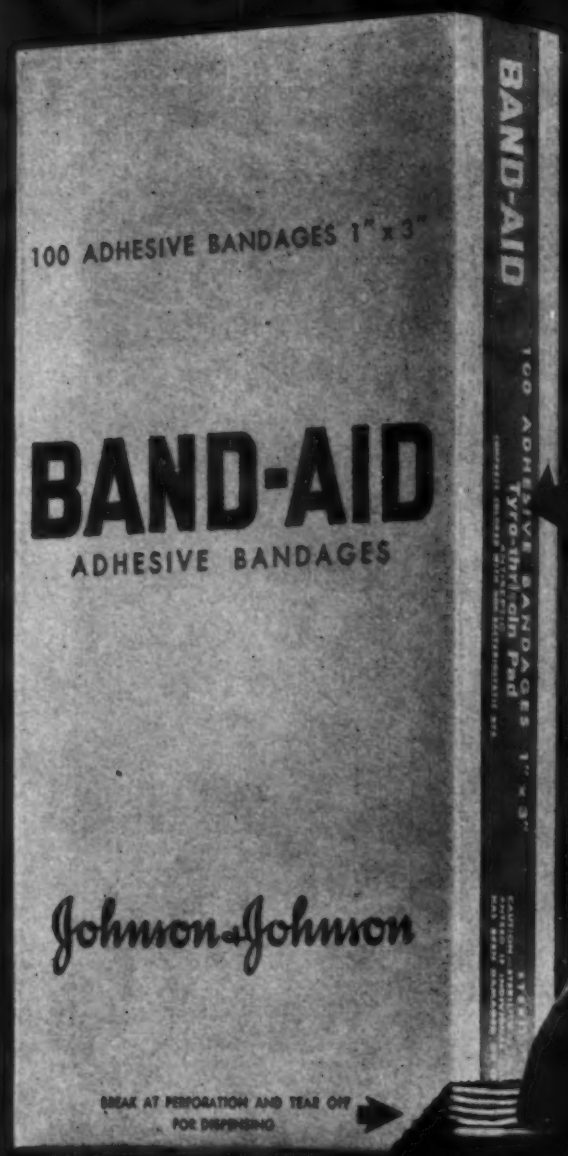

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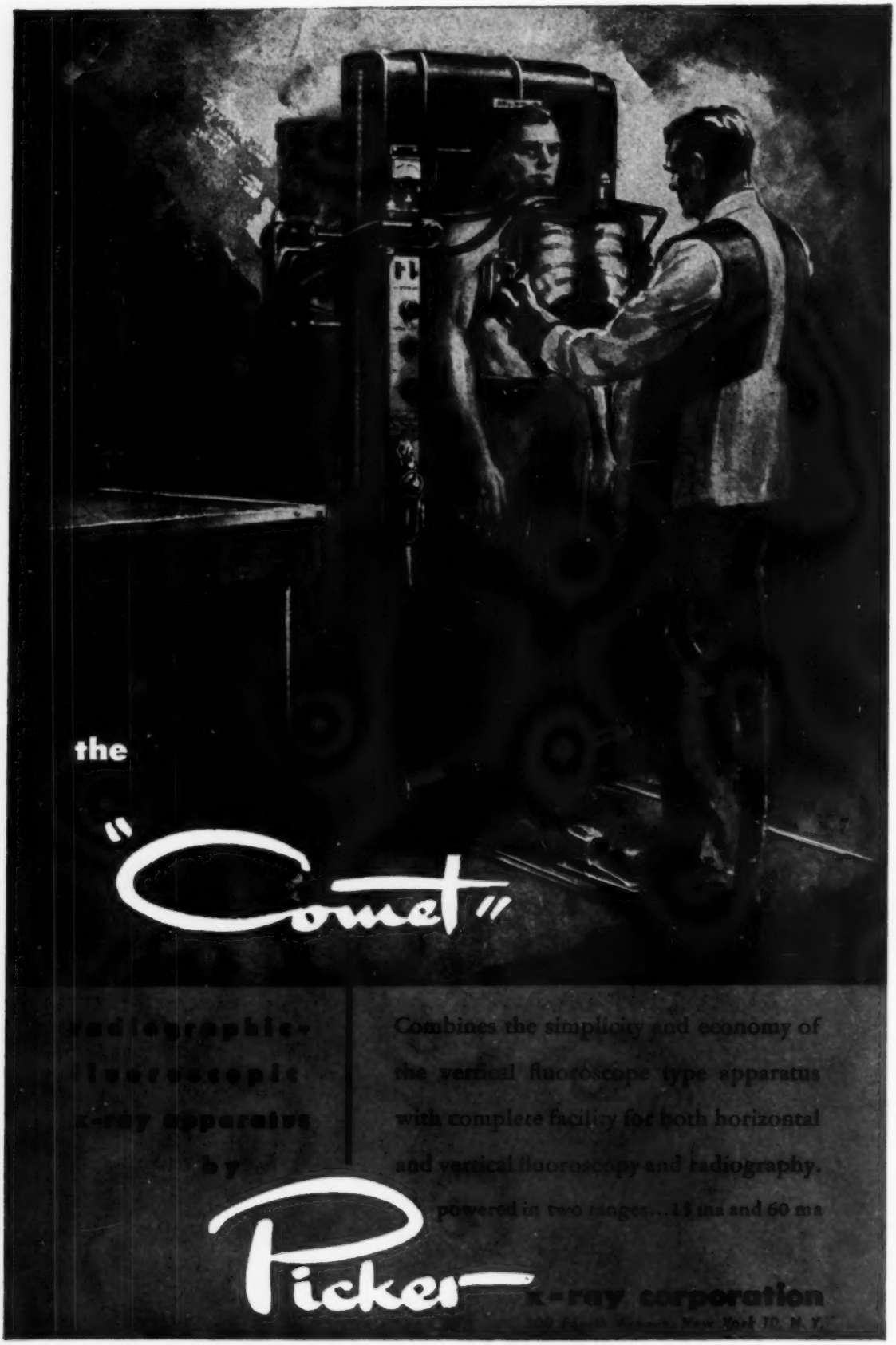
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Industrial Medicine | Volume 16 | APRIL, 1947 | Number 4 | Industrial Medicine

This Month

A VITAMIN Supplement ..... A. C. Ivy, M.D. 163
—Effect of Administering, in Capsules, to Groups of Workers in the Steel Industry
(With F. T. Jung, Ph.D., M.D., F. C. Bing, Ph.D., and Lilian Cisler, M.D.)

PEPTIC Ulcers ..... J. Dewey Bisgard, M.D. 168
—Surgical Management in Railway Employees

ACUTE Head Injuries ..... M. J. Owens, M.D. 169
—Diagnosis and Management

SYSTEMATIZING Accident Investigation ..... R. Ralph Bresler, M.D. 172
—On a Medical Department Basis

MEDICAL Departments in Small Plants ..... Nathan Millman, M.D. 174
—Layout, Equipment and Cost

THE POST-CHOLECYSTECTOMY Syndrome ..... Chester C. Guy, M.D. 181
—Analysis: Treatment

INDUSTRIAL Sanitation ..... George W. Reid 183

EDITORIAL: When is a Shrimp an Oyster? 185

CHEMICAL Eye Injuries ..... P. M. Van Arsdell, M.S. 188
—First Aid

AMPUTATION of the Leg ..... Raymond Householder, M.D. 196

MASS Immunization, Types A & B ..... Bernard S. Dignam, M.D. 200
—In an Industrial Plant

INDUSTRIAL HEALTH and DISEASE:
Relation of Nutrition to Dental Caries 202
—Present Knowledge

Benzol 211

Personal ..... 8 General 10
Dr. Pilgrim 4
News, Comment, Opinion 216

The Buffalo Conference

American Association of Industrial Physicians and Surgeons
Thirty-second Annual Meeting
American Association of Industrial Nurses
Fifth Annual Meeting
American Industrial Hygiene Association
Eighth Annual Meeting
American Association of Industrial Dentists
Fourth Annual Meeting
American Conference of Governmental Industrial Hygienists
Ninth Annual Meeting

Buffalo, New York—April 29-May 4, 1947

IN SUBMITTING his article "Systematizing Accident Investigation" (page 172), DR. BRESLER writes: "Since the inception of a new medical program at Sharp & Dohme early in 1946, our accident frequency rate has dropped from 21.8 in 1944 and 23.7 in 1945 to 4.56 in 1946. A good part of the credit for this drop goes to a new form put in use here—a form which creates a natural tie-in between the appropriate department manager, the safety engineer, and the plant physician. This form, perhaps more than our safety classes and lectures, has helped impress on department managers their responsibility for safe conditions in their departments. The form is essentially medical in nature and is initiated and completed in the Medical Department" . . . . The following paragraph is from the latest published report of the A.M.A. Council on Industrial Health (J.A.M.A., January 14, 1947): "*Medical Services Operated by Labor Unions*—In consideration of greater labor participation in industrial medical affairs, the Council expects to bring up to date its information about existing medical services operated by labor unions". . . . THE item on DR. SCHWARTZ'S retirement from public service to consultant status on his own is adapted from *Industrial Hygiene Newsletter* for March. Interestingly, DR. SCHWARTZ is the subject of a feature article in *Coronet* for April. . . . MISS VAN ARSDELL'S "First Aid for Chemical Eye Injuries" (page 188) is by far the finest contribution on the understanding of caustic hazards to eyes that has yet appeared in print. It comes at a time when such information is urgently needed, and is the opening article of a series which will evolve the permanent authoritative text on the subject. This is indicated in the Foreword by DR. HEDWIG KUHN. . . .

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MERIDEN CONNECTICUT

DR. PILGRIM

EXPERIENCING an enjoyable contact with WILLIS MCLACHLAN, a Canadian engineer of long acquaintance and very active in the safety field, desiring to know about courses in industrial medicine for his son. . . . AND breaking both door keys of the automobile, with consequent inconvenience as might be expected, meanwhile becoming aware of unusual improvement in the bowling scores. . . . AND meeting DR. HUBERT SMITH by appointment and lecturing to the junior and senior medical and dental students at the University of Illinois on the "Medicolegal Aspects of Industrial Medicine," observing much interest in the same on the part of the students, which is a decided change in attitude over former years. . . . AND occupied routinely with periodic examinations in lead and silica dust exposures, and encountering the usual problems of adjustment. . . . AND at the desk, with many reports, some on a dermatitis problem recently investigated, and others on x-ray films of the chests of dust-exposed employees. . . . AND welcoming BERT HANMAN back to the United States after his almost six-months' tour of Europe in studying job placement procedures, and much interested to hear of the chaotic conditions in Europe and the particularly bad conditions in London and parts of England; and thinking that the work done by MR. HANMAN should go a long way in helping to establish smoother international relationships. . . . AND to my office, across the street from the scene of the recent blast in Chicago, and to inspect the office which was damaged very little, and putting up with the inconvenience of no heat and no water for several days; and, between visits to the office, discussing with BERT HANMAN and CARL PETERSON the various possibilities regarding a foreign guest speaker for the Section on Preventive and Industrial Medicine and Public Health of the A.M.A. Centennial at Atlantic City, in June—

Aloe, A. S., Company 216
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Meat
American Sterilizer Company 14
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Formaldehyde Germicide
Bauer & Black 207
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Becton, Dickinson & Co. 205
Ace Cotton No. 1
Breck, John H., Inc. 199
Hand Preparations
Bristol-Myers Company 214
Sal Hepatica
Bristol-Myers Company 204
Trushay
Burdick Corporation, The 23
Ultraviolet Equipment
Burnham Soluble Iodine Co. 218
Iodine
Cambridge Instrument Co., Inc. 213
Plethysmograph
Camp, S. H., & Company 203
Scientific Supports
Campho-Phenique 201
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Ciba Pharmaceutical Products, Inc. .... 4th Cover
Privine
Cutter Laboratories 187
Penicillin
Debruille Chemical Corp., The 191
Debamin
Denver Chemical Mfg. Co., Inc. 215
Antiphlogistine
Denver Chemical Mfg. Co., Inc. 202
Galatest-Acetone Test
Desitin Chemical Co. 218
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Dome Chemicals, Inc. 6
Dermatitis Therapy
Eaton Laboratories, Inc. 211
Furacin
General Cellulose Co., The 201
S'Wipes
Hynson, Westcott & Dunning, Inc. 210
Thantis Lozenges
Industrial Medicine Publishing Company 210
"Introduction to Industrial Medicine"
Iodine Educational Bureau, Inc. ..... 2nd Cover
Iodine
Johnson & Johnson 1
Tyrothricin Band-Aid
Kny-Scheerer Corporation 16
Surgical Instruments
Leeming, Thos., & Co. 212
Baume Bengué
Lilly, Eli, and Company 24
Pharmaceuticals
Lily-Tulip Cup Corporation 218
Paper Cups
Macalaster Bicknell Company 197
Fenwal Equipment
Merrell, Wm. S. Company, The 193
Nitranitol
Nutrition Research Laboratories 18, 19
Ertron
Occy-Crystine Laboratory 6
Occy-Crystine
Parke, Davis & Company 13
Benadryl
Picker X-Ray Corporation 2
X-Ray Apparatus
Rees-Davis Drugs, Inc. 4
Hydrosulphosol
Reynolds, R. J., Tobacco Co. 206
Camel Cigarettes
Schenley Laboratories, Inc. 9
Penicillin
Schering Corporation 7
Sulamyd
Sharp & Dohme 5
Throthricin
Shield Laboratories 209
Riasol
Stearns, Frederick, & Company 11
Adnephrin
Upjohn 17
Gelfoam
Van Nostrand, D., Co. 201
Textbook on Poisons
West Disinfecting Company 22
Sulpho Hand Cleaner
White Laboratories, Inc. 20, 21
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(1) Combes, F. C.: Indus. Med., July, 1944.
(2) Parkes, Morey: Indus. Med., January, 1944.

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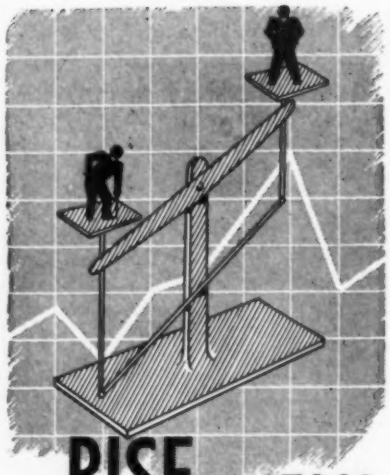

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*Speckman, E. W. et al: Am. J. M. Sc., 202:68, 1941.

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along with the matter of exchange editors and correspondents for INDUSTRIAL MEDICINE and *Occupational Medicine.* . . . AND attending a luncheon conference at which were DRS. CARL PETERSON and HAROLD HENNESSY of the Council on Industrial Health of the A.M.A., and DR. L. D. JANIS, of the U. S. Public Health Service, with interesting converse on industrial medical and hygienic procedures, and the study of medical care plans. . . . AND meeting brother Byron and sister Olga on their way through Chicago to vacation in Arizona, and between trains having a pleasant visit and dinner at the Country Club. . . . AND again at our friends, the GLENN GARDINERS, for dinner and evening, enjoying the children and much appreciating the return of the piano after it had been serviced, completing the evening with music in pleasant assortment. . . . AND then to Detroit for the annual meeting of the MICHIGAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, where there were many old friends in industrial medicine, among them DRS. SELBY, BROOKS, MILLER, WHITTAKER, BROWN, HOLMBLAD, HUSSEY, SAWYER, WOODY, and others, and considerable discussion of industrial medical education and literature, and DR. D. J. LEITHAUSER speaking most interestingly on "Early Post-operative Activity to Shorten Disability," and DR. SAWANIE GASTON on "Group Study of the Painful Back," giving experiences and statistics from a back clinic which has been established at the Presbyterian Hospital, New York City; and spending one of the evenings with nephew LEWIS and going over art collections and the playing of records of symphonic music, which was most enjoyable; and being taken to the train by DR. WESTON and his lady. . . . AND, back home, at a dinner meeting of an engineering group, with discussion of problems on standards of engineering practices in industry and the servicing of various types of industries through engineering methods. . . . AND at one of the regular weekly rehearsals of the Chicago Business Men's Symphony in preparation for the spring concert, at which rehearsal Percy Grainger, the soloist, was to have appeared but didn't, because his train was four hours late. . . . AND then downstate to visit a small plant manufacturing numerous types of electrical devices, in which there seems a dermatitis and lead problem, this now being investigated through inspections and conferences with the industrialists; and again much impressed with the cooperation on the part of the officials. . . . AND finding it a while possible to put in a number of consecutive days at the desk, concentrating on survey material in preparation for a final report

—Continued on page 218.

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PERSONAL

A FELLOWSHIP in Industrial Medicine has been established at the School of Medicine, University of Pittsburgh, by the Schenley Distillers Corporation. The Fellowship carries a residency of 18 months at the School of Medicine, University of Pittsburgh, and is to be known as the Schenley Fellowship. Further particulars may be had by writing to the Director, Department Industrial Hygiene, School of Medicine, University of Pittsburgh, Pittsburgh 13, Pennsylvania.

DR. JAMES M. DUNNING, retiring president of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS, has recently been appointed Dean of the School of Dental Medicine at Harvard University. DR. DUNNING has been a guiding factor in the Association since its founding.

DR. LYMAN D. HEACOCK, retiring secretary of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS has been named Chief, Research and Training Division, Dental section of the Veterans Administration.

DR. C. FREDERICK YEAGER, Remington Arms Company's Medical Director, Bridgeport, is chairman of the Industrial Health Committee of the Connecticut State Medical Society which is sponsoring a program of management-physician conferences to further the interest of industrial managers in problems of employee health. As part of the society's public relations program, the conferences will be held at various industrial plants throughout the state.

HAROLD R. HENNESSY, M.D., executive officer for the committee on professional relations, Council on Industrial Health, of the American Medical Association, has been honored with the title of Chevalier de l'Ordere de la Santé Publique of France. DR. HENNESSY, who resides in Winnetka, Illinois, received the medal and scroll of the order for his public health work in France during the war. Part of the two years he served in the European theater were spent as chief public health officer, Civil Affairs Section of the General Staff of Communications zone, ETO-USA. A holder of the Bronze Star medal, COLONEL HENNESSY in October, 1945, was admitted to Knighthood in the Order of Orange-Nassau, degree of Officer of Swords, by special decree of Wilhelmina, Queen of the Netherlands.

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GENERAL

THE U. S. Public Health Service has just issued three new publications to spur an effective education program. "Facts About Syphilis and Gonorrhea" is a revised edition of pamphlet number 10 in the Workers' Health Series. It is simply written and tells the story of cause, spread and cure. It contains the facts every adult should know. If workers follow the advice in "Wedding Plans" and "Protecting the Unborn Baby," the spread of VD, especially to innocent and unsuspecting victims, can be drastically cut. Sample copies of the pamphlets are available free on request to U. S. Public Health Service, Washington 25, D. C. Quantity orders (prices are indicated on the back of each pamphlet) should be purchased from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Wisconsin Industrial Clinics

INDUSTRIAL medical in-plant clinics scheduled for Racine, April 8; Fort Atkinson, April 9, and Green Bay, April 10, are being presented by the council on scientific work of the State Medical Society of Wisconsin in cooperation with the committee on industrial health of the Wisconsin State Medical Society and the industrial hygiene unit of the state board of health. Subjects to be discussed at Racine are exposures of hot metals, heavy machinery, dust, fumes, solvents and eye injuries; at Fort Atkinson, exposures of foundry paints, handling of sheet metals and eye injuries, and at Green Bay, exposures of rollers, damp working conditions, chemical solvents and eye injuries.

—*J.A.M.A.*, March 22, 1947.

Industrial Dentists

THE ANNUAL meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS at Buffalo, New York, April 30-May 1, 1947, will be held in the Statler Hotel, with the exception of a field trip to a nearby industry under the direction of DR. E. J. GUILLAUME, of E. I. du Pont de Nemours Company. On Wednesday morning, April 30, the Board of Directors are to convene at 10:00 A.M. At 2:00 P.M. there will be a business meeting of the AAID. Wednesday evening will be devoted to the whims and fancies of those choices usually made by the members or further discussions of business matters. Thursday, May 1, the entire membership is invited to accept the invitation of DR. GUILLAUME to participate in the field trip. After the luncheon, the group will convene to hear DR. L. S. MORVAY, of Newark, New Jersey, on "Conservative Procedures in the Treatment of Acute Dental Injuries in Industry"; DR. CARL L. SEBELIUS, of Nashville, Tennessee, on "Ways

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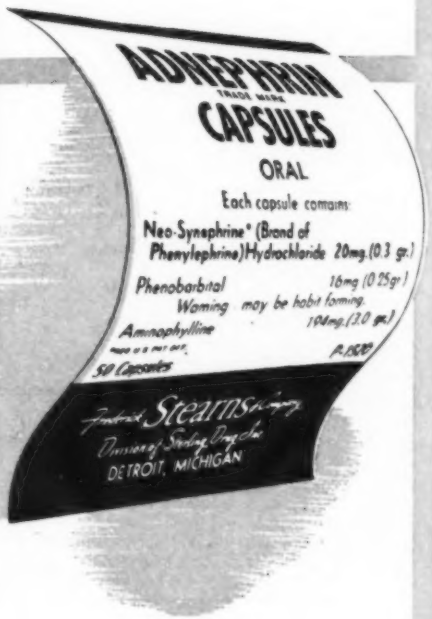

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in Which a State Health Department can Assist with Dental Health in Industry"; DR. J. E. DE CAMP, of Corning, New York, on "The Administration of a Dental Program in the Glass Industry"; DR. E. R. ASTON, of Harrisburg, Pennsylvania, on "Dental Relations in a State Industrial Hygiene Program." On Thursday, at 9:30 A.M., DR. C. RUSSEL FRICKE, the first President of the AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS, will deliver, before the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, an interesting account of the "Growth of an Industrial Dental Program in a Pittsburgh Industry."

Western Association

WESTERN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS has the following program scheduled at this time for its Annual Meeting at Hotel Biltmore, Los Angeles, April 29:

"The Prevention of Colds in Industry"—DR. HOBART REIMANN, Professor of Medicine, Jefferson Medical College, Philadelphia.

"Plastic Repair of Contractures Following Burns"—DR. WM. S. KISKADDEN, Los Angeles.

"Medical Services in Small Industrial Plants"—DR. HUGH DIERKER, General Motors Corporation, South Gate, California.

"Industrial Health Activities in the California Department of Public Health"—DR. J. WALTER HOUGH, California Health Department, Berkeley, California.

"Industrial Health Training in the University of California"—DR. LEON LEWIS, Associate Professor of Industrial Health, University of California, Berkeley.

(An industrial medical topic to be announced)—DR. JOHN R. ERWIN, Medical Director, Boeing Aircraft Company, Seattle Washington.

(Industrial hygiene topic to be announced)—DR. A. V. NASATIR, Los Angeles City Health Department, Los Angeles.

Central States Meeting

THE CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE and SURGERY and the CHICAGO SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY will hold a joint meeting at the Palmer House, Chicago, on Tuesday, May 13, 1947, during the week of the Illinois State Medical Convention. Following is the preliminary program:

Tuesday Morning, May 13, 1947

FUNGUS Infection of the Skin in Industry"—J. H. MITCHELL, M.D.

"Differential Diagnosis and Treatment of Low Back Pain"—E. L. COMPERE, M.D.

"The Cardiac Case in Industry"—H. H. STEINBERG, M.D.

"Vascular Disorders of the Lower Extremity"—M. G. FLANNERY, M.D.

"Plastic Surgical Reconstruction of the Thumb"—PAUL W. GREELEY, M.D.

Tuesday Afternoon, May 13, 1947

JOINT Session with Surgical Section, Illinois State Medical Society, 2:00 P.M.

To Cut Home Mishaps

A CITY-WIDE committee to reduce accidents in the home, which caused 1,724 deaths in New York last year, is being organized by the Greater New York Safety Council. Organization of the home safety committee was one of seven goals for the current year listed in the council's annual "Hazards and Horizons" report.

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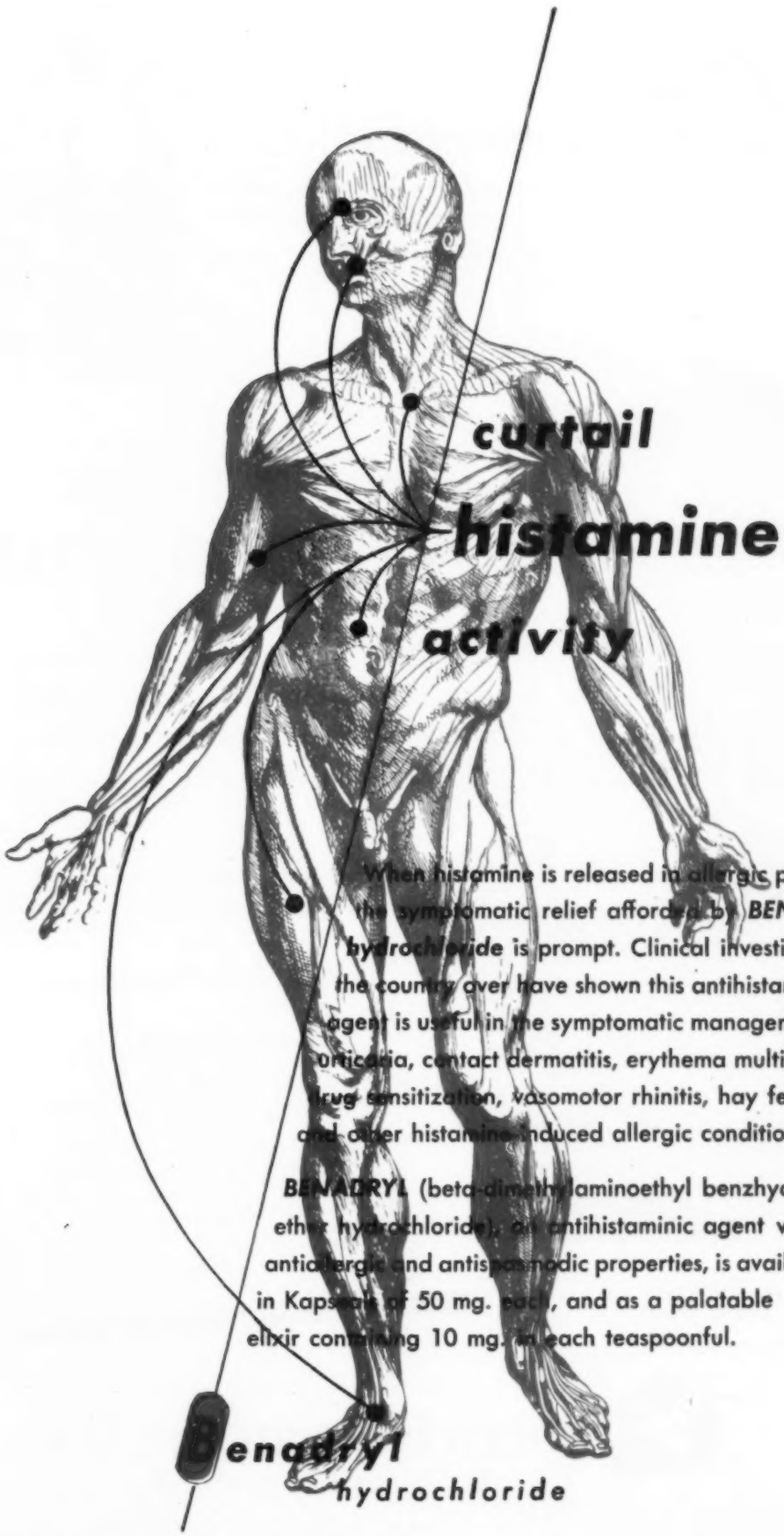

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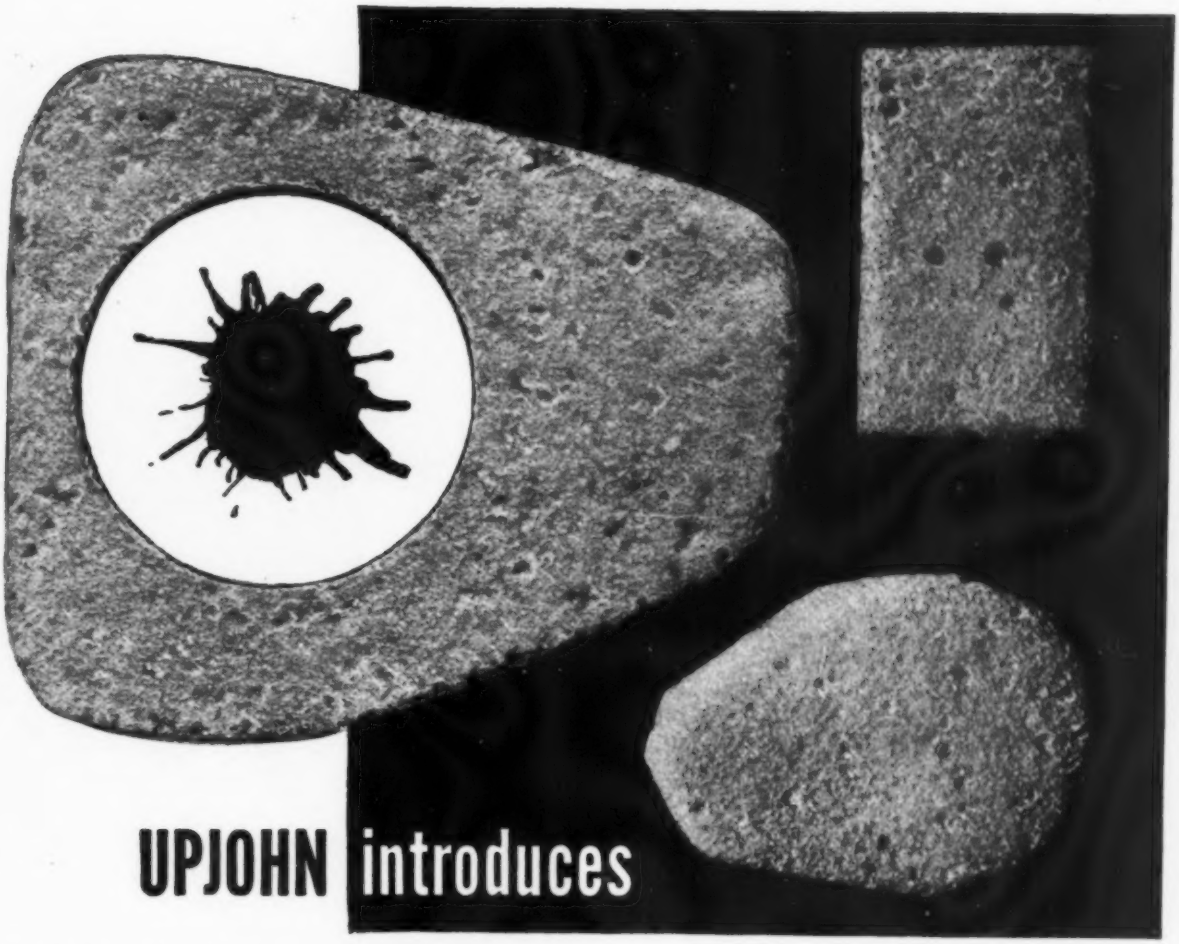

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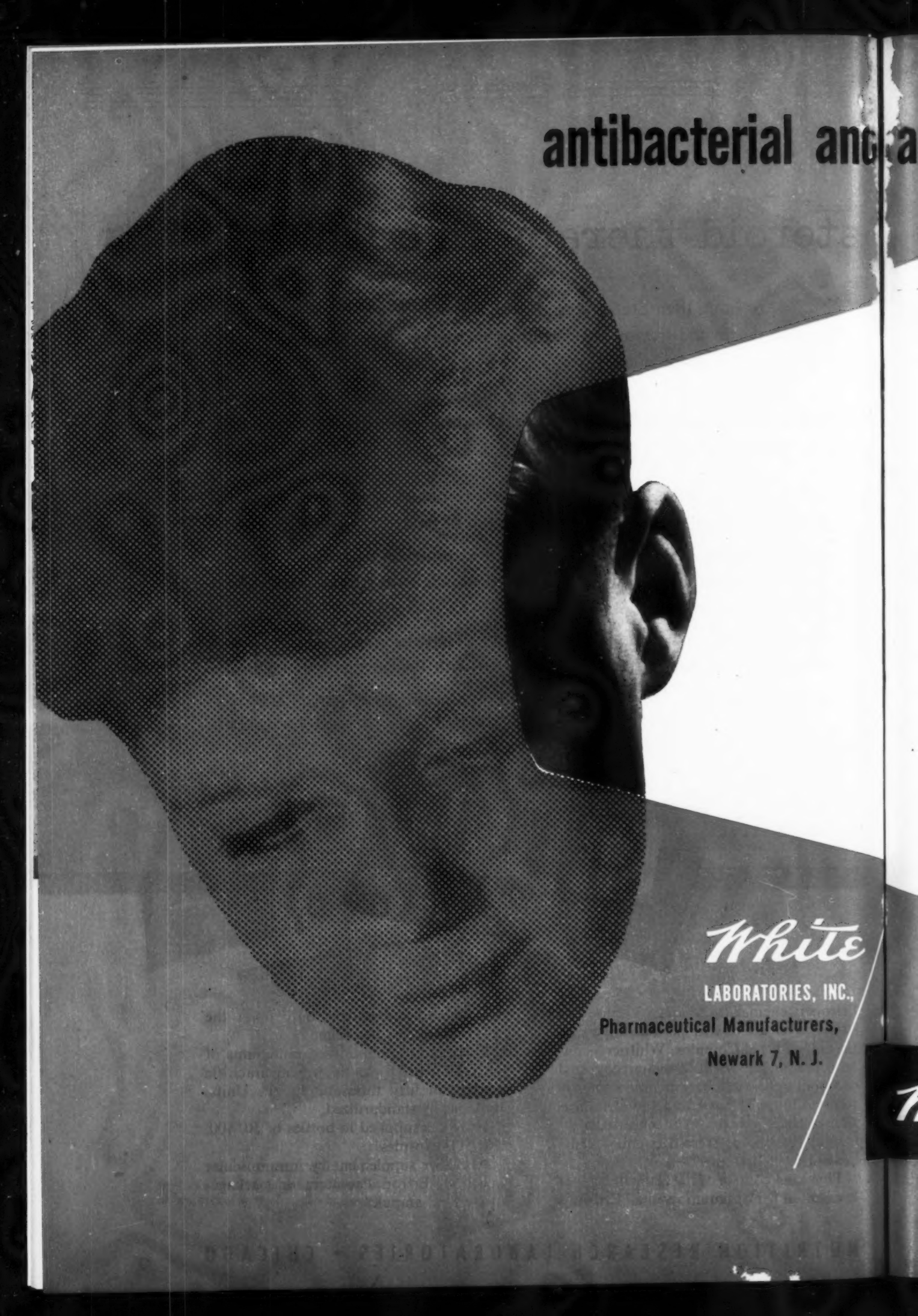
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The Science, the Law and the Economics of Industrial Health

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The Effect of Administering a Vitamin Supplement, in Capsules, to Groups of Workers in the Steel Industry

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THIS report provides the principal observations made during an experiment designed to determine whether beneficial effects could be detected from the administration of a mixture of vitamins to a group of workers in the steel industry. The workers were observed from November 1, 1944, through August 31, 1945. In addition, the production and absentee records of the workers were obtained for a significant period prior to the experiment. The length of this period depended on the nature of the work.

Methods

THE general design of the experiment consisted in dividing the workers into three groups, one being called the A Group, another the B Group and a third the C Group. The workers belonged to or were known as being in the same group throughout the entire experiment. The persons in the A Group belonged to one mill crew shift or "turn"; those in the B Group to another shift, and those in the C Group to the third shift. These shifts rotated, so that it was unnecessary to control the factor of the period of the day during which the men worked.

At the start of the experiment Group A received the active or vitamin or Alpha capsules; Group B, the inactive or placebo capsules which appeared and smelled like the active capsules; Group C received nothing. The Groups were then reversed in regard to the type of treatment they received during each of three periods. A worker, for example, may have taken vitamin capsules during Period I (November 1, 1944, through the following February), placebo capsules during Period II (March, 1945, through June), and no capsules during Period III (July, 1945, through August).

The workers with a few exceptions received all three types of treatment. The daily supply of capsules was placed in an envelope marked with the worker's voucher number and given to the worker on the job each day by his foreman or by the captain of the crew. On days off the worker received a "take-home" supply. Every possible effort was made to maintain secrecy in regard to the nature of the capsules received. Even the General Superintendent of each mill did not know the difference between the capsules until well into the second period of the experiment. Conversation between the workers of different shifts or crews could not be controlled, though this conversation was observed to be both of a positive and negative nature. The workers received "base plus incentive" pay and appeared to be well motivated.

The occupational environments of these workers were rather diverse. Accordingly, the occupational groups were kept distinct in administering the program of treatment and in recording the results. For example, in the "24-inch bar mill" there were three mill crews, each crew consisting of 19 or 20 men; for this group the schedule of treatment is shown in Table 1.

TABLE 1.

Mill Crew	Period I Nov. - Feb.	Period II Mar. - June	Period III July - Aug.
A	Vitamin	Placebo	Placebo
B	Placebo	Placebo	Vitamin
C	Nothing	Vitamin	Placebo

The occupational groups, 15 in number and identified herein by letters from J to Z, may be described as follows: J—Washers in tin mill; L—Crew in 76-inch hot mill: M—Crew in 76-inch finishing mill; N—Assorters (women) in tin mill; P—Chippers in plant 2; Q—Crew in 14-inch merchant mill; R—Crew in 24-inch bar mill; S—Crane men in 24-inch bar mill; T—Table operators in 28-inch mill; U—Crew in 76-inch hot mill (GOP Machine); V—Crew in 76-inch hot mill (Streine machine); W—Sheet picklers in tin mill; X—Crew in 44-inch finishing mill; Y—Reckoners in tin mill; Z—Bundlers in cold mill.

The vitamin supplement supplied to the workers contained the following: Vitamins A, 5000 U.S.P. units; thiamine hydrochloride, 6 mg.; riboflavin, 6 mg.; niacinamide, 40 mg.; ascorbic acid, 150 mg.; vitamin D, 800 U.S.P. units.

Results

QUESTIONNAIRES: *Period I.* The following data present the results obtained from questionnaires

We are grateful to MR. F. M. GILLIES, Works Manager, DR. E. H. CARLETON, Medical Director, MR. S. J. AURELIUS, Industrial Relations, the Supervisors and the workers of the Inland Steel Company who took part in these tests for their splendid cooperation.

filled in by the workers at the end of the first period of observation.

QUESTION 1. How do you feel since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.					
**Appetite poorer than before.	Negative**	57	48	37	60
*More pep than before.	Positive*	62	52	25	40
	Total	119		62	

The reported improvement in the feeling of well-being on the part of 52% of the workers who received vitamin capsules and the 40% who received placebo capsules was apparently psychological. Since the difference between the two figures could occur by chance, (Chi-square test), it cannot be concluded that the vitamin capsules were more potent than the placebo capsules in increasing the feeling of well-being.

QUESTION 2. How has your appetite been since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.					
**Appetite poorer than before.	Negative**	62	52	43	70
*Appetite better than before.	Positive*	57	48	18	30
	Total	119		61	

Chi-square = 5.61; P = 0.018.

The difference between 48 and 30% is a significant difference indicating that the vitamin capsules improved the appetite. Because one foreman turned in 20 positive and five negative answers to the question, the possibility of bias had to be considered. It was found that the foreman had filled out the questionnaires for the workers. The data were then reconsidered with this group omitted, though the production of this group increased and the absenteeism decreased during this period. When the possibly biased data were omitted the following data were obtained:

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.	Negative**	57	61	43	70
**Appetite poorer than before.	Positive*	37	39	18	30
*Appetite better than before.	Total	94		61	

Chi-square = 1.57; P = 0.21.

The difference between 39 and 30% is not significant. It should be mentioned that the omission of these possibly biased data from this group of workers does not influence the results obtained for the other questions. The advisability of omitting the possibly biased data may be questioned because it must be assumed that the foreman was biased in favor of an improvement in appetite and not in favor of an improvement in a feeling of well-being and in sleep (Question 3). However, it is scientifically proper to consider the goodness of any isolated item of data. The advisability of having done this becomes clear when we consider the results obtained when the groups were reversed, during Periods II and III.

QUESTION 3. How do you sleep since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before: Sleep poorly.					
**Sleep more poorly than before.	Negative**	80	67	38	64
*Sleep better than before.	Positive*	39	33	22	36
	Total	119		60	

There is no significant difference between 33 and 36%.

QUESTION 4. Have you felt so much better that you would buy the capsules at a drug store?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	66	56	14	23
No.....	51	44	47	77
Total	117		61	

Chi-square = 18.1; P = 0.00001.

The difference between 56 and 23% is strikingly significant, suggesting that the vitamin capsules caused an over-all beneficial effect.

QUESTION 5. Would you buy the capsules at cost from the Company?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	78	66	35	56
No.....	41	34	27	44
Total	119		62	

Chi-square = 1.43; P = 0.25.

The difference between 66 and 56% is not significant.

QUESTION 6. Would you continue to take the capsules if they were given to you free?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	93	80	41	67
No.....	24	20	20	33
Total	117		61	

Chi-square = 3.25; P = 0.07.

The difference between 80 and 67% is considered insignificant, since it could occur by chance in seven of 100 similar cases.

We believed it to be advisable to ask the following question in order to ascertain if vitamin supplements were being taken at home and if the advertising of vitamins had significantly affected this group of workers to the extent that they actually purchased vitamins at a drug store.

QUESTION 7. Do you take other vitamins in addition to those furnished by the Company?

	Vitamin		Placebo		Total
	No.	%	No.	%	
Yes.....	3		6		9
No.....	115		55		170
Total	118		61		179

Only nine of the 179 purchased vitamin supplements. The six persons in the Beta group who purchased vitamins could not be eliminated because they worked in various shifts and the production of the shift was being measured and not of individuals.

COMMENT: It is to be noted that the placebo capsules apparently improved the feeling of well-being, appetite and sleeping in approximately 35% of the workers. With the exception of the effect on sleeping, the vitamin capsules caused a greater though insignificant subjective improvement than the placebo capsules. Omitting the possibly biased data, it is clear that the vitamin capsules had no significant influence on those who took them as compared to those who took the placebo capsules. This was true until the questions pertaining to the willingness of the workers to continue to take the capsules were asked.

These latter questions, i.e., Questions 4, 5 and 6 were intended to attempt to assess any over-all favorable affect the vitamin capsules might have as compared to the placebo capsules. Three questions were

asked on this point with the idea of evaluating the extent of the value derived from the vitamin capsules, if any. It was believed that if the vitamin capsules were really beneficial, the workers would desire to purchase them. If they were of little benefit, they might continue to take them, if they were provided by the Company free of charge.

The workers who received the vitamin capsules replied in the affirmative to the three questions as follows:

QUESTION 4, would buy at drug store: 56% Yes.
QUESTION 5, would buy from Company: 66% Yes.
QUESTION 6, would take if given free: 80% Yes.

The workers receiving the placebos replied affirmatively to the same questions as follows:

QUESTION 4, would buy at drug store: 23% Yes.
QUESTION 5, would buy from Company: 56% Yes.
QUESTION 6, would take if given free: 67% Yes.

As might be anticipated, the majority of workers in both groups expressed a willingness to continue taking the capsules, if the Company provided them free of charge. A lesser majority of the workers in both groups expressed willingness to take the capsules if provided by the Company at cost. The percentage of affirmative answers to both questions was higher in the groups receiving the vitamin than the placebo capsules. However, the differences in the percentages of the affirmative answers for the vitamin and placebo capsules were not statistically significant. The affirmative replies to Question 4, "Have you felt so much better that you would buy the capsules at a drug store?" yielded a statistically significant difference; 56% of the workers receiving the vitamin capsules asserted that they would, whereas only 23% of those receiving the placebo capsules so indicated.

This latter finding in addition to some apparently favorable results from the vitamin capsules on production and absenteeism caused us to continue the study and to reverse the groups as indicated in Table I.

PERIODS II AND III. The following are the results of the questionnaires filled in by the workers after the treatment groups had been reversed and the experimental period of four months had been terminated.

QUESTION 1. How do you feel since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.					
**More tired than before.	Negative**	39		56	
*More pep than before.	Positive*	23	37	42	41
	Total	62		98	

The difference between 37 and 41% is not significant.

QUESTION 2. How has your appetite been since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.					
**Appetite poorer than before.	Negative**	43		62	
*Appetite better than before.	Positive*	20	31	36	36
	Total	63		98	

The difference between 31 and 36% is not significant.

QUESTION 3. How do you sleep since taking the capsules?

		Vitamin		Placebo	
		No.	%	No.	%
**Same as before.					
**Sleep more poorly than before.	Negative**	49		66	
*Sleep better than before.	Positive*	14	22	32	32
	Total	63		98	

The difference between 22 and 32% is not significant.

QUESTION 4. Have you felt so much better that you would buy the capsules at a drug store?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	35	55	29	29
No.....	28		70	
Total	63		99	

Chi-square = 11.11; P = 0.0009.

The difference between 55 and 29% is significant, as was the result on this question in the first experimental period.

QUESTION 5. Would you buy the capsules at cost from the Company?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	37	59	49	50
No.....	26		50	
Total	63		99	

Chi-square = 1.32; P = 0.25.

The difference between 59 and 50% is not significant.

QUESTION 6. Would you continue to take the capsules if they were given to you free?

	Vitamin		Placebo	
	No.	%	No.	%
Yes.....	52	84	81	83
No.....	10		17	
Total	62		98	

The difference between 84 and 83% is not significant.

QUESTION 7. Do you take other vitamins in addition to those furnished by the Company?

	Vitamin	Placebo
Yes.....	3	2
No.....	60	94
Total	63	96

Only five of 159 workers bought vitamins at a drug store.

COMMENT: Again it is to be noted that the placebo capsules "improved" the appetite, the feeling of well-being, and sleeping in approximately 35% of the workers.

The combined results of the two questionnaires indicate to us that the vitamin supplement did not significantly improve the appetite, the feeling of well-being and the sleep of these workers *considered as a group*. The summary of affirmative answers in Table 2 show that the trend was in favor of the vitamin capsules in the first set and against them in the second set of questionnaires. In other words, as regards appetite, feeling of well-being and sleeping, the workers could not tell the difference between the vitamin and placebo capsules.

TABLE 2.

SHOWING THE PER CENT OF AFFIRMATIVE ANSWERS FOR THE VITAMIN AND PLACEBO CAPSULES IN THE FIRST SET OF QUESTIONNAIRES AND IN THE SECOND SET AFTER THE "REVERSAL" OF THE GROUP

QUESTION	1st Set % Positive Ans. Vitamin	1st Set % Positive Ans. Placebo	2nd Set % Positive Ans. Vitamin	2nd Set % Positive Ans. Placebo
1. feel better than before.....	52%	40%	37%	41%
2. appetite better than before.....	39%	30%	31%	36%
3. sleep better than before.....	33%	36%	22%	32%
4. would buy from drug store.....	56%	23%	55%	29%
5. would buy from Co. at cost.....	66%	56%	59%	50%
6. would take if given free by Co....	80%	67%	84%	83%

The answers to Questions 4, 5 and 6 were consistent with the answer to the same questions in the first set of questionnaires. That is, the workers would just as soon receive free or buy at cost the placebo as the vitamin capsules; however, if they had to buy the capsules at the drug store they would prefer the vitamin to the placebo capsules.

The explanation for the observation that the workers were apparently able on two occasions to distinguish between the vitamin and placebo capsules when asked if they would buy them at a drug store and not in the case of 10 other questions is not clear. The fact that they selected the vitamin capsule twice in answer to the same question may have been due to chance, but the chance is remote. Or, they may have preferred the active capsule in case they had to buy it at drug stores because of some over-all effect of the active capsule. We considered other possibilities as the following. Digestive upsets were not involved because as many "digestive complaints" were alleged to have occurred after taking the placebo as the vitamin capsules. The fact that the treatments were reversed among the A, B, and C shifts shows that the possible assumption by the workers that a "B-group" is second rate as compared to an "A-group" is untrue. If the workers had obtained some knowledge regarding which were the vitamin and placebo capsules, the answers to all six questions should have been prejudiced in favor of the vitamin capsules.

Though it may be suspected that the preference for the vitamin capsule in the case of one of the six questions was due to a chance factor or to some hidden experimental error, the evidence leaves no question regarding the morale improving effect of a placebo capsule or a manifestation of interest in the worker.

Production Figures

WHEN the study was planned and while the first data were coming in, it seemed feasible to make observations on the output of the workers so as to compare the production of the groups receiving different treatments. Such comparisons obviously had to be made separately for each of the 15 occupational groups.

It soon became clear that the data were altogether too heterogeneous even within each group to render a complete analysis of all the data worthy of presentation. This was evident at the end of the first period when comparisons were made between the production figures of the various shifts. There were as many decreases as increases in the production of the mill-jobs regardless of whether they were receiving vitamins, placebo or no capsules. Nevertheless production data were kept throughout the three periods.

It is inappropriate to present all the data collected because it illustrates nothing of medical significance. However, it is appropriate to present the data from one occupation or mill where the data appeared to be least heterogeneous and least subject to uncontrollable factors. These data will also provide some idea of one of the methods used for consideration of the possible effects of the capsules on production.

The data come from Occupation Group T or the group of 28-inch mill table operators. In this occupation the output of a given table is significantly affected by the sizes of the material assigned on any given day. The superintendent stated that the only possible unit was the ton. The actual tonnage could, however, be corrected empirically so as to make the "slow stuff" roughly comparable to the "fast stuff." This correction is made in Table 3. In addition we

TABLE 3.
COMPARISON OF PRODUCTION IN TONS FOR OCCUPATION T
(28-INCH MILL TABLE OPERATION)
(JANUARY 1945)

Treatment Group	Production	
	Actual Tons	Corrected Tons
Vitamin, "A" Turn	730.4	737.6
Placebo, "B" Turn	789.6	764.0
Nothing, "C" Turn	714.4	736.0
Over-all average	744	745

were told that the difference between the amount of "fast" and "slow stuff" would average out between the three turns or shifts over a period of three months. Nevertheless, the superintendent kept a record of the percentage of 100-ton, 75-ton, and 50-ton material assigned to each crew.

One method of comparing the production of the three turns receiving different treatment is shown in Table 3 in which the actual and corrected tonnage of each turn is compared for the month of January, 1945. It is to be noted that correction of the tonnage makes some difference in the output, though over a period of months correction is unnecessary.

It was believed that the type of comparison of the output of the three turns could be best compared by compiling the data as is shown in Table 4. In this

TABLE 4.
COMPARISON OF PRODUCTION IN TONS FOR OCCUPATION GROUP T
(28-INCH MILL TABLE OPERATION)

Tabulation	Month	Average Tons Per Turn (Minus Delays)		
		A Turn	B Turn	C Turn
I	Aug., 1944	721.6	692.0	718.4
	Sept., 1944	695.2	743.2	668.0
	Oct., 1944	726.4	718.4	744.0
	Average	714.4	718.8	710.1

	Treatment Introduced	Vitamin	Placebo	Nothing
II	Nov., 1944	732.8	779.2	730.4
	Dec., 1944	768.8	779.2	730.4
	Jan., 1945	730.4	789.6	714.4
	Average	744.0	782.7	725.1

COMPARISON OF AVERAGES IN TABULATIONS I AND II

Percentage of Gain	4.1	8.8	1.9

table the gain in output of each turn or shift for three months before and after the institution of the treatment is presented. It was known by a study of production over a preceding period that the B shift on the average produced more than the A shift and the A shift more than the C shift. The percentage gain indicates that the placebo capsule received by the members of the B shift was as potent in increasing production as the vitamin capsules received by the members of the A shift. The results are not significantly altered when the "rolling rates on sections" for the various shifts are considered. When the groups were reversed and the members of the C shift received vitamin capsules, no significant changes which indicated that vitamin capsules were superior to placebo capsules occurred.

The slight increase in percentage gain shown by the B shift on the placebo capsules could be matched by a slight increase in production in two other occupational groups receiving vitamin capsules. However, no significant differences in production of groups receiving vitamins versus placebos was demonstrable in any of the occupations.

One observation was made which deserves mention. The "chippers" who use an air-driven chisel in their work continually and have much stooping and crouching to do, reported that the capsules decreased back

and muscle aches. This was recorded, but the difference between the group on vitamin and placebo capsules was not significant possibly because too few cases were involved in this study. It would be worthwhile, we believe, to repeat this phase of our study on a larger group of "chippers."

Absenteeism

IT WILL be noted that the per cent of absences in the workers while receiving vitamin capsules was 10.7; placebo capsules, 9.9; and no capsules, 12.5 (See Table 5). The per cent absenteeism due to illness in the workers while receiving vitamin capsules was 3.9; in those receiving placebo capsules, 2.5; and, in those receiving no capsules, 3.7. There are in these data no significant differences showing that the vitamin capsules influenced absenteeism.

TABLE 5.
SUMMARY OF DAILY ATTENDANCE RECORD OF WORKERS ACCORDING TO TREATMENT-GROUP AND OCCUPATIONAL-GROUP

	Vitamin Capsules				Placebo Capsules				No Capsules			
GROUP	n	w	a(v)	a(i)	n	w	a(v)	a(i)	n	w	a(v)	a(i)
J	6	548	31	0	6	564	14	1	6	471	15	14
M	4	287	4	14	3	206	6	8				
N	3	281	0	4	12	908	59	39	12	719	105	43
P	71	5997	620	634	44	3629	432	136	54	3340	447	177
Q	64	4572	985	232	54	9096	1120	242				
R	56	5775	41	6	56	4537	28	5				
T	10	722	8	2	8	1108	13	5	4	284	97	2
U	7	582	0	18	9	590	0	63	20	750	0	36
V	7	393	0	17	9	514	0	46	19	718	0	58
W	15	2403	103	2	8	705	12	37	8	1561	141	3
X	12	1310	13	39	24	1916	22	65	15	185	2	2
Y	22	1129	8	69	9	718	37	36	18	446	50	20
Totals:	213	23799	1813	1037	188	24491	1743	683	148	8474	858	355
Work-Days: t	= 26,649				26917				9,687			
Quotients:												
a(v) + a(i)/t	= 10.7%				9.9%				12.5%			
a(v)/t	= 6.8%				6.5%				8.8%			
a(i)/t	= 3.9%				2.5%				3.7%			
W/t	= 89.3%				90.1%				87.5%			

n = number of workers in each group
w = number of days worked by these workers
a(v) = number of days of voluntary absences of these workers
a(i) = number of days of illness of these workers

General Discussion

WITH the exception of the expressed willingness of the workers to purchase the vitamin in preference to placebo capsules at a drug store, all of our data show that as a group these workers were not measurably affected by the supplement of vitamins. As indicated above, since this was the only apparently decisive instance of a positive effect from the vitamin capsules, it is suspected as a chance coincidence or a hidden experimental error.

Borsook and Wiehl[1] in a somewhat similar study on aircraft workers found that vitamin supplementation as compared to placebo supplementation had no effect on absenteeism rates during the first six months of their study. In the last six months the total absenteeism rate was significantly reduced from 4.79 days per 100 working days to 3.9 days. The rates due to illness (2.19 days for the placebo and 1.98 days for the vitamin group) were not significantly reduced. The vitamin group was superior to the placebo group in regard to the Merit Review ratings made by the supervisors. They conclude: "Taken together, these findings of less absenteeism from causes other than illness, lower turnover rates, and higher Merit Review ratings for the vitamin group seem to indicate that superior industrial morale was the major factor underlying the superiority in all three respects of the vitamin group in the later months of the study year."

In our study the rate of absenteeism due to illness was lowest in this placebo group and approximately the same in the vitamin and no-treatment groups. The voluntary absenteeism rate was higher in the no-treatment group than in the vitamin and placebo groups. The only possible influence on absenteeism was that the lower rates of voluntary absenteeism occurred in the vitamin and placebo groups. This is the same difference observed by Borsook and Wiehl in the last six months of their study between their placebo and vitamin groups, and we observed this difference in our entire study between those who received capsules and those who did not.

Thus the simple taking of capsules apparently had a favorable effect on voluntary absenteeism and no effect on that due to illness.

As regards labor turnover, practically none occurred in the group of workers involved in this study.

As regards Merit Review, this was not made in this Company, since tonnage production was the best objective measure. This, it must be granted, is subject to certain uncontrollable factors in most of the occupations in a steel mill. Nevertheless, these tend to average out during a period of several months, but the data obtained are such that relatively large differences would be required to establish significant differences.

It should be emphasized that the conclusion stated above does not imply either that all individuals were on a fully adequate diet, or that the vitamin supplement was in any way unsatisfactory. As a group, these workers did not need the vitamin supplement in so far as the objective measures we used could detect.

Summary and Conclusion

TWO hundred and forty-one steel workers in 15 occupations were initially divided into three groups which were called A, B, and C groups according to the shift to which they belonged. The shifts rotated, so there was no shift that always worked during the day or night. For four months the A-group received vitamin capsules, the B-group placebo capsules, and the C-group nothing. Then the treatment was reversed without changing the group label for four months and then in certain instances another reversal of the treatment was made for two months. Absentee records were kept on the 241 workers for a variable period. One hundred sixty-two of the initial 241 workers were in the same occupational group at the end of the 10 months of study so that their production could be measured and the results of two questionnaires compared.

With the exception of the expressed willingness of the workers to purchase vitamin in preference to placebo capsules at a drug store, all our data show that, as a group, these workers were not measurably affected more by the vitamin than the placebo capsules. Either some over-all influence of the vitamin capsules as compared to the placebo capsules caused the workers to feel better, or some subtle experimental error or a chance coincidence operated to cause the data to indicate that the workers were able to select the vitamin in preference to the placebo capsule. The questionnaire evidence leaves no question regarding the morale improving effect of a placebo capsule or a manifestation of interest in the worker.

Reference

1. Nutritional Status of Aircraft Workers in Southern California, HENRY BORSOOK, California Institute of Technology, Pasadena, 1946; see also, *The Milbank Memorial Fund Quarterly*, Vol. XXIII, No. 2, April, 1945, pp. 113-160; *ibid* Vol. XXIV, No. 3, July, 1946.

The Surgical Management of Peptic Ulcers in Railway Employees

J. DEWEY BISGARD, M.D.,
District Surgeon, Union Pacific Railroad,
Omaha, Nebraska

IT IS the impression of the staff of the Medical Department of the Union Pacific Railroad that the incidence of peptic ulcer among railway employees is higher than in the general population. If this is true, it is as one would expect upon the basis of the etiological factors most generally accepted. First, the psychogenic factor. The majority of railroaders have a responsibility in a precise and integrated system which exacts much anxiety and tension. Second, irregular feeding habits. We recognize a fairly constant association of hyperacidity with ulcer and the necessity of neutralizing the acidity in treatment. It is probable that the gastric secretions are not able in themselves to cause a break in the gastric mucosa, but there can be no doubt that once a break has occurred they have a destructive action upon the submucosal tissues and discourage or prevent healing. Skipped meals leave the stomach unprotected and vulnerable to the action of concentrated gastric secretions. Third, chilling. A few years ago I demonstrated that chilling of the body; that even the immersion of the hands in ice water caused a sharp rise in gastric acidity. Certainly, many railway employees are subjected to sudden and drastic changes of temperature.

The factors responsible for the increased incidence of ulcer make radical or surgical treatment necessary in a larger percentage of the cases. Medical management fails more often because not only does the nature of the work make frequent feeding and rest impossible but also there seems to be less patient cooperation owing to indifference and in some instances to ignorance.

Unfortunately we have grouped ulcers of the stomach and ulcers of the duodenum under the inclusive term, peptic ulcer. This is unfortunate because it implies that the ulcers in the two locations, that is, ulcers of the stomach and ulcers of the duodenum, are identical lesions. From a clinical point of view, this is far from the truth. The most important difference is the fact that, almost without exception, ulcerating lesions of the duodenum are benign and there is no urgent problem in differential diagnosis. In the stomach, cancer is a common lesion and often produces ulceration which is indistinguishable from benign ulcer. On account of this difference in ulcers of the stomach and ulcers of the duodenum, our guiding principles of treatment should be radically different.

I believe that most surgeons are agreed that duodenal ulcers are primarily medical problems and become surgical problems only as complications develop. On the other hand there are some of us who feel that essentially all ulcerating lesions of the stomach, both benign and malignant should be considered malignant and surgical problems to be investigated at operation. The complications for which surgical intervention is indicated in duodenal ulcers are perforation, obstruction, hemorrhage and intractable pain.

Perforation into the free peritoneal cavity is a surgical emergency, and there is difference of opinion only in regard to the method of handling. It is a general practice in this country to close the perforations by simple suture and there is no question but that this is the procedure to be followed by surgeons who have had little experience with radical gastric surgery. In many clinics in Continental Europe, emergency primary resections are done in all cases that have been perforated less than 24 hours and are otherwise in good physical condition. I have done primary resection of the stomach in 15 cases with perforated ulcers. All had diffuse soiling of the peritoneal cavity and all had been perforated less than 12 hours. Curiously enough, statistics show that resection in this group of cases is attended by lesser mortality and morbidity than simple closure. This also has been my experience; one fatality in my 15 cases, a death from coronary thrombosis in an alcoholic.

What is the advantage of primary resection? It gives better than 90% permanent cures as contrasted to less than 50% of cures following simple closure.

Second, obstruction of the duodenum or of the pylorus which fails to release under medical management can be relieved only by operation.

Third, ulcers which hemorrhage grossly and repeatedly should receive surgical management. Not only is there always the hazard of a fatal hemorrhage but each episode of bleeding is accompanied by a long period of disability. Since hemorrhages in individuals beyond 45 years of age are so frequently fatal, emergency gastric resections should be done at the onset of the initial hemorrhage. Too often these cases are treated expectantly and surgical consultation sought in panic only after they have become hopelessly exsanguinated. With present facilities for an adequate supply of blood and for pouring it in through two or three veins simultaneously it is possible to replace blood faster than it is lost, and support the patient during operation. After bleeding is controlled, restoration of normal blood volume can be accomplished rapidly by continuing the blood transfusions.

Fourth, pain and distress which are intractable to adequate medical management are definite surgical indications. Ulcers which produce these symptoms usually have penetrated the posterior wall of the duodenum.

Gastroenterostomy and gastric resection have been the accepted operations for ulcers and in recent years resection has rapidly replaced gastroenterostomy almost to the point of extinction of the latter. During the past three years, Dragstedt has treated a series of cases by division of the two vagus nerves, with prompt healing of the ulcers and relief of symptoms in most instances. The nerves are dissected from the wall of the esophagus and segments resected, either through a sub-diaphragmatic approach or through the chest. Too little time has elapsed to evaluate the procedure. I have done vagotomy in 16 cases in the last 12 months and the results to date have been very satisfactory. All cases are well and take unrestricted diets with no distress. Three cases had troublesome gastric and intestinal distention during the immediate convalescence and in one instance, it was necessary to reopen the abdomen and supplement a gastroenterostomy to relieve pyloric obstruction. In three additional cases a gastrojejunostomy was done at the time of the vagotomy to relieve pyloric obstruction which had existed prior to operation.

Gastric Ulcers

ULCERS of the stomach develop the same complications which require surgical interference as duodenal ulcers and develop these complications with much greater relative frequency. But as stated earlier in this discussion the principal reason for considering gastric ulcerations as primarily surgical problems is the frequent occurrence of cancer which often in its

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early stage is indistinguishable from benign ulcers not only by history and physical signs but by x-ray examination as well.

The delay in the recognition of carcinoma of the stomach has been attributed much too generously to the patient's indifference to his symptoms and reluctance to consult a physician. Unfortunately, the evidence in the majority of instances also incriminates the medical profession. This is attributable to certain misconceptions regarding the disease. It is not generally appreciated that despite every available means of diagnosis it is impossible in an astonishingly large percentage of cases to differentiate early carcinoma of the stomach from benign gastric ulcer. This fact and its importance in respect to early diagnosis and treatment have been brought out in the singularly important publications of Allen and Welch and of Walters, Gray, and Priestley. From a study of 2469 cases of carcinoma of the stomach Walters, Gray, and Priestley found that 37% of the patients who had operable carcinomas of the stomach and 25% of the patients with inoperable lesions gave histories that were typical of benign ulcer, and furthermore, the distressing fact that 80% of the patients with carcinoma of the stomach who gave typical ulcer histories gained temporary relief of symptoms from medical management. Unfortunately, relief on an ulcer regimen is often interpreted by both the physician and patient as confirmatory evidence of the benign character of the lesion, with the result that definitive treatment is delayed and the patient's chance of cure correspondingly reduced. The patient relieved of distress is likely to disregard instruction to return for follow-up observation until symptoms recur.

In the same series of cases these authors found that by x-ray study the diagnostic error was reduced to 10%; that is, in 10% of the cases the roentgenologists diagnosed carcinomatous lesions as benign ulcers. In an additional 14% of cases they stated that the diagnosis was indeterminate.

Similarly, Allen and Welch reported 277 cases which had been diagnosed and treated as gastric ulcers at the Massachusetts General Hospital. In this series there were 39 cases in which the ulcers subsequently were proved to be carcinomatous, an error of 14%.

The advantage to be gained from resecting carcinomas when they are indistinguishable from benign ulcers is brought out emphatically by Allen and Welch. In a series of 30 cases in which the preoperative diagnosis was benign ulcer but in which the resected specimens proved to be carcinoma, 40% were living and well five years after operation. These results were compared with those obtained in 93 cases in which resections were done for lesions which were obviously carcinoma preoperatively. Only 20% of this series was living and well at the end of five years.

How is it possible to salvage by early resection this sizable important group of cases which masquerade as benign ulcers? To reach the largest number of cases at the earliest and most favorable time would necessitate resection of all ulcerating lesions of the stomach. This radical principle is not without its advocates.

Obviously, the application of this principle would result in the resection of many uncomplicated benign ulcers, but this is acceptable in the minds of the advocates of the principle on the basis that benign gastric ulcers as a group are better treated by resection. This opinion is held with due respect to operative mortality which, in experienced hands, is small compared to the normal mortality from complications as hemorrhage, obstruction and perforation. Furthermore, if some of the carcinomas arise in chronic benign ulcers, then resection may, on occasion, have prophylactic merit.

A more conservative but less certain and less expeditious method is that of clinical trial. By this method all questionable cases are placed on a rigid ulcer regimen, preferably with bed rest for a period of three weeks. At the end of this time all patients who fail to obtain relief should be resected without delay. Certain of these refractory cases are benign ulcers but are sufficiently intractable to necessitate resection. All remaining patients without exception and irrespective of relief of symptoms, should be re-examined roentgenographically. The patient must be impressed with the necessity of re-examination and with the fact that relief of symptoms on an ulcer regimen does not preclude the possibility of a malignant tumor. Carcinoma can be excluded with certainty only by evidence of progressive and final healing of the lesion in serial roentgenographic studies. It is not enough to demonstrate merely a reduction in the size of a crater but it is obligatory to carry out roentgenographic examinations every two weeks thereafter, until all evidence of the ulcer crater has disappeared. An ulcer regimen may cause a reduction in the inflammatory reaction around a carcinomatous ulcer and create the illusion that the crater has become more shallow and smaller. After an experience of this sort the writer has insisted upon a complete roentgenographic follow-up.

It goes without saying that all lesions which fail to regress or fail to heal after an initial regression should be resected.

The Diagnosis and Management of Acute Head Injuries

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Kansas City, Missouri

SEVERE head injuries are a rather frequent problem in both private and industrial practice. Although much has been learned about the proper diagnosis and management of these cases, they continue to be one of our most difficult problems. Statistical analysis shows that many hundreds of persons die annually of acute epidural and subdural hemorrhages. A goodly number of these die before being seen by a physician. Some avail themselves of medical aid but for one reason or another are not properly hospitalized and observed. Others are observed and die for want of a simple trephine of the skull. These intracranial hemorrhages often are extreme emergencies. Many of us do not have the services of a neurosurgeon immediately available, accordingly, it behooves the general surgeon to acquaint himself more thoroughly with the problem which confronts him in the average case.

In the time at hand it is possible only to review a few of the more important features of care and diagnosis. As always, the history of injury is of first importance. The time, severity, and exact character of trauma should be ascertained if possible and carefully recorded. By so doing we may occasionally rule out such conditions as diabetic coma, hypertensive encephalopathy and drug poisoning. The presence or absence of a lucid interval is of prime importance because it almost invariably indicates either epidural or subdural hemorrhage. The findings on physical examination must be accurately recorded. If it is

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decided to observe the patient, we are interested in progression of symptoms and signs. The state of consciousness of the individual is noted. Lacerations, bruises, depressed fractures of the skull and fractures elsewhere are looked for.

Neurological examination is carried out as completely as possible depending on the ability of the patient to cooperate. In our opinion the reliance on the importance of eye signs has been over-emphasized. However reaction of the pupils to light and inequality of the pupils are of important significance when correlated with the other neurological findings. Bilateral dilated and fixed pupils are a bad sign and indicate impending death. There is often unilateral dilatation of the pupil, this on the side of a mass lesion. We do wish to emphasize the fact that one may have a massive epidural or subdural hemorrhage with no alteration of the pupils. Examination of the fundi is difficult and in the early stage there is rarely demonstrable swelling of the discs.

Unilateral peripheral facial weakness may be an early sign of hemorrhage. In the comatose patient examination of the other cranial nerves is not very helpful.

Observation of the tendon reflexes and the changes from hour to hour may indicate the course of procedure. The reflexes are depressed or absent immediately following a severe head injury and usually become hyperactive later on. Inequality of these reflexes and the presence of a positive Babinski are of great diagnostic importance. Estimation of motor power may reveal a unilateral weakness even before loss of consciousness or during a lucid interval.

Battle's sign and effusion of blood about the orbit are more accurate indications of fracture than the x-ray on some occasions.

We feel that it is most important properly to instruct receiving ward personnel. We tell them that any individual who has sustained a head injury with unconsciousness should be admitted to the hospital for observation. If this is not feasible, his immediate family should be warned of the importance of signs of drowsiness, headache, vomiting and told to return him to the hospital if any of these develop. One usually finds the interns and residents too anxious to suture scalp wounds. When there is any evidence of severe damage to the brain, the wounds should be given only minimal cleansing and dressing.

Suturing of scalp wounds should be done only when one is confident that debridement and cleansing have been complete. We have recently seen two patients who had had their large scalp wounds sutured and who later developed infections which spread between the galea and pericranium producing massive accumulations of pus. Both of these patients were severely ill as the result.

Treatment of shock is a first consideration, as in all cases of trauma. Shock is rarely severe or prolonged in head injury alone but may in case of multiple injuries present a serious problem. Intravenous plasma or 10-50% glucose in distilled water is given in quantity sufficient to control shock. Other injuries should be left alone during the acute phase except the control of hemorrhage. Certainly no attempt at reduction of fractures of the long bones should be done until such time as we are certain that the head injury sustained is not immediately serious.

X-rays of the skull are valuable in diagnosis and prognosis. They are rarely necessary early because, with the exception of depressed fractures, they do not alter immediate treatment. The films are usually unsatisfactory when taken with a portable machine or when the patient is unable to cooperate. Demonstration of shift of a calcified pineal indicates a space taking lesion but we can diagnose it clinically as well. Films should not be made until the patient is in good condition. Fractures of themselves, unless they be depressed or extend into the sinuses, mastoid or ear, are not important. They cause damage secondarily by crossing the middle meningeal and its branches, by causing tears in the dura, and by involving nerves and vessels entering or leaving the skull. Severity of fracture as shown by x-ray does indicate the force which produced it and gives some estimate of the amount of damage that we may expect to the brain tissue. X-rays are necessary in every case, but should be employed at the proper time with a definite purpose in mind.

When our patient is put to bed with his head elevated we must plan a careful program of care, observation and recording. If he is restless or delirious we must provide barbiturate, paraledehyde or chloral hydrate. I am sure that it is not here necessary to warn against the many dangers encountered in giving narcotics to these cases. Observation includes frequent neurological examination which may show changes in motor power, reflexes or state of consciousness which may be indicative of the development of a space taking lesion. The blood pressure, temperature, pulse and respiration are recorded on a graphic chart at frequent intervals.

When patients suffer severe headache or continue unconscious, hypertonic solutions are indicated. There has been much controversy about this matter. We are certain that many of our patients have shown marked improvement following the use of such therapy. A few have been maintained while awaiting preparation for trephining. The concentrated solutions of plasma which are now easily available are superior in many respects to glucose and sucrose. Five hundred cc. of plasma in double concentration combined with 50 cc. of 50% glucose exerts a marked effect in increasing the osmotic pressure of the blood. These solutions must be given slowly. Theoretically, at least, rapid injection would increase blood and filtration pressure and cause further elevation of intracranial pressure.

The decision to make operative intervention seems to be the big stumbling block in this problem. When there is any suspicion whatsoever of extradural or subdural hemorrhage—trephine. If we do not look for these lesions in the obscure cases, we will miss a goodly percentage of them. In our experience, typical cases comprise only about 50% of the total. Exploratory trephine done under local anesthesia is a simple procedure. It carries practically no mortality even in the seriously ill patient. When a mass lesion is not found, we do no damage. Some feel that patients with severe contusion of the brain actually benefit by the trephine because it helps reduce intracranial pressure. We have successfully accomplished this procedure with the patient propped up on the backrest of his hospital bed. This is rarely necessary but has been feasible in individuals with multiple other injuries such as fractures of the long bones.

We watch for progression of signs if not sure of the diagnosis. Given a patient with one of the following situations we would trephine:

1. History of trauma followed by unconsciousness, a lucid interval, then stupor or increasing drowsiness.
2. If there is development of unilateral signs of a mass lesion, such as paralysis, Babinski, dilatation of one pupil. Any one of these unilateral signs may indicate alone a space taking lesion.
3. Prolonged unconsciousness with development of

bradycardia and elevating blood pressure accompanied by some unilateral change.

4. Sudden onset of unconsciousness within hours after a head injury usually indicates epidural bleeding.

Clinical diagnosis is unfortunately not too accurate in these cases. We have trephined for hemorrhages in apparently typical cases and found metastatic carcinoma, severe cerebral contusion and cerebral edema in one case ultimately shown to be due to multiple fat emboli. We have also recently observed a man with a history of trauma, no localizing signs of any type, profound coma and basilar fracture and seen a massive extradural hemorrhage at the autopsy.

When exploration is done, if the hematoma is not found on one side, the opposite should in all cases be explored. When a hematoma is found by anterior trephine, but the large mass of the accumulation is posterior, an additional posterior opening must be made. In one case where this was not done, the subdural drainage was adequate for 24 hours. Symptoms recurred because the posterior accumulation had forced the brain up against the preliminary opening. Recover was secured after the second opening was made On finding a subdural hemorrhage, the clot should be removed by suction and a rubber tissue drain placed just within the dura. When extradural hemorrhage is found it is usually necessary to enlarge the opening with rongeur, identify the bleeding point and secure it with silver clip or ligature. Occasionally it may be advantageous to turn on osteoplastic flap.

Several conditions other than the hemorrhages necessitate operative intervention. Compound fractures should be cleansed mechanically and debrided with removal of the skin edges and primarily closed with non-absorbable material. Open wounds of the brain itself should also be treated by primary closure after removing necrotic brain tissue by suction and complete cleansing. Depressed fractures are elevated early only when they produce marked symptoms. All of any magnitude should be treated surgically. Since the advent of the sulfa drugs and penicillin, I feel that we may treat fractures into the sinuses more conservatively. Whereas in fractures into the frontal sinus with discharge of spinal fluid through the nose we formerly opened the sinus, drained the hemorrhage present and closed the dural defect, we now give massive doses of the sulfas and penicillin and treat the patient expectantly.

In the time remaining I should like to review the essentials of a few of the entities seen and show examples of these types of cranial trauma.

The multiple petechial hemorrhages are seen in almost all cases of severe cerebral trauma. They may be present alone or with other injuries such as contusions and lacerations.

Cerebral contusion may be manifest at the site of the blow or contre-coup and may give localized signs indistinguishable from the hemorrhages. Contusions, when severe are almost always accompanied by some degree of subdural hemorrhage, presumably due to blood escaping from the arachnoid into the subdural space.

In severe contrecoup contusions of the brain, there are at times intra-cerebral hemorrhages as a result.

Epidural hemorrhage occurs commonly in conjunction with fractures. Arterial bleeding from the middle meningeal and its branches causes rather sudden onset of unconsciousness following a comparatively short lucid interval. There is commonly sudden onset of hemi-paresis, change in pulse and blood pressure, Cheyne-Stokes respiration, collapse and death unless operative intervention is undertaken early.

Acute subdural hemorrhage represents venous bleeding and is not so frequently associated with fracture. The lucid interval may last several days before the onset of focal symptoms. If it is longer, as is usually the case, we have a chronic subdural hematoma which may not assert itself for many weeks or even months. These are frequently caused by trauma of insignificant force. The acute subdural hemorrhages more often are associated with more severe trauma, contusion of the brain or laceration of the brain. Many feel that the contusions and lacerations responsible for them are more important than the hemorrhage. This is a matter of the individual case.

CONCLUSION: Careful observation, proper supportive treatment and timely surgery will do much to reduce both mortality and morbidity of head injuries. For all cases the supportive measures of sedation, maintenance of fluid balance and the use of hypertonic solutions are indicated. Fractures of themselves are not of importance immediately unless they are depressed. Open injuries to the brain demand the same sort of debridement, cleansing and closure that we accord any traumatic wound. If one maintains a high index of suspicion and explores in doubtful cases he will find and save more cases in which epidural or subdural bleeding has taken place.

Dr. Louis Schwartz

DR. LOUIS SCHWARTZ, long-time Chief, Office of Dermatology, Industrial Hygiene Division, U.S.P.H.S., ended his active service in that position March 1, and, on his sixty-fourth birthday, July 4, will be officially retired. "For more than 41 years he has been serving the public, first in immigration inspection and later in the field of industrial hygiene where he developed his reputation as one of the nation's leading dermatologists. For 15 years he filled assignments in various parts of the world. After examining immigrants when they entered the country, he was medical officer on the Coast Guard Cutter Tahoma and later at the Out-Patient Clinic of the Seattle Marine Hospital. Then he went to the Marine Hospital at San Francisco, and from there to the Philippines for four years where, in addition to quarantine duty, he was in charge of eye, ear, nose, and throat surgery at Southern Island Hospital, Cebu. After four more years in immigration at Philadelphia, he was assigned to the new industrial hygiene program under Dr. Lewis R. Thompson. Except for a two-year interruption, with the American Consulate in Montreal, he has been with the Industrial Hygiene Division since 1919. Among his earlier studies from which standards were evolved was a comprehensive investigation of the postures of babies, school children, soldiers, industrial workers, and many other groups of people. He wrote widely on this subject, emphasizing his findings: that posture is an inherited characteristic, that it does not affect health, that it varies with the muscular tone and with moods, and that the same general rules for sitting and standing cannot be followed with comfort by every one. About 1926, while Dr. Thompson was visiting in England, he met and was impressed by Dr. R. Prosser White. On his return, he asked DR. SCHWARTZ to start a series of research projects on industrial dermatoses. The results—his identification with the successful solutions of hundreds of dermatological problems in industry—are nationally known. Among the highlights of his career are the discovery of two efficacious chemicals never before used in the treatment of fungous infections: salicylanilide and copper undecylenate; and his use of the patch test which has been developed and publicized until it has become an accepted technique. He has devised many educational courses of value in understanding and diagnosing occupational dermatitis. He is an energetic, persevering man, thorough, kindly toward people, and eager to continue his work after he retires." His advice and counsel will be available in a consultant capacity.

Systematizing Accident Investigation

R. RALPH BRESLER, M.D.,
Chief Plant Physician,
Sharp & Dohme, Inc.,
Philadelphia

ONE of the most obvious, and yet very frequently neglected, aspects of medical-safety control is the prompt and thorough investigation of accidents. Ideally, of course, the prevention of all accidents is the goal of any medical safety program.

It is true that, in the course of daily plant operation, some accidents do occur which could not have been anticipated. These are, however, definitely in the minority, for most accidents fall into the category of personnel or mechanical malfunction, largely avoidable under an active medical-safety program. Accepting the basic premise, then, that most accidents can be prevented, the immediate questions arise after an accident: Why did it happen? How? Could it have been prevented? If so, how?

Obviously, once having been given a direct lead to a safety hazard of mechanism or procedure by the occurrence of an accident, the next step is to ascertain the circumstances involved. Prompt action is essential in order to forestall the occurrence of a second accident under the same conditions.

In some organizations, brief and casual questioning of the injured employee comprises the entire investigation. In others, the safety engineer's attempts at investigation are nullified by indifference on the part of the department manager, and inability on the part of the employee to recall details of an accident which occurred several days or weeks before.

The greatest defects in many medical-safety programs currently in effect are the time lag in accident investigation, and the lack of full cooperation between the interested parties.

In the medical-safety program in this organization, department managers are made directly responsible for safety and safe conditions in their departments. They are urged to call upon the safety and medical departments for assistance and guidance, and the use of their technical and professional facilities.

To insure prompt investigation where indicated, and to make certain that all individuals properly concerned share in the responsibility for the correction of safety hazards, a "Report of Accident" form has been prepared and is now in use at Sharp & Dohme plants.

The "Report of Accident" form, herewith reproduced, is padded alternately in white, pink and yellow, the white copy imprinted "Medical Dept. Copy," the pink "Dept. Manager's Copy" and the yellow "Safety Engineer's Copy."

The form is prepared in the dispensary by or for the plant physician immediately after the patient has received medical attention. The patient's description of the accident is recorded as nearly as possible in his own words. Specific questions are asked where clarification of any point is needed. The names of witnesses are recorded. A provisional diagnosis is made as to the nature and extent of the injury, and the immediate disposition of the patient is indicated. Where an employee is permitted to return to work but is limited, owing to a temporary disability, this is indicated in the "Special Work" block, and complete details as to the extent and nature of the limitation are indicated in the "Remarks" section.

Certain cases require no investigation. Thus, where a stenographer handles a sharp pencil carelessly and scratches a finger, the safety engineer would not ordinarily be called upon to investigate. In such a case, this would be indicated under "Recommendations for Investigation." Where a non-incapacitating injury occurs and the matter is deemed worthy of investigation, it may be indicated as "Routine." Where a serious injury has occurred or where the injury is only moderate but was potentially serious, investigation is given high priority. In these cases, the safety engineer is also notified at once, by telephone.

Any additional pertinent comments are added under "Remarks" and the report is signed by the plant physician. It is then taken promptly, by messenger,

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SHARP & DOHME, INC.
MEDICAL DEPARTMENT
REPORT OF ACCIDENT

To: Manager, Dept. _____, and Safety Engineer, (in turn):

NAME _____ DEPT. _____ OCCUPATION _____

LOCATION OF ACCIDENT _____

Date of Injury _____ 19____ _____ (Time) Reported to Dispensary _____ (Date) 19____ _____ (Time)

Witnesses: _____

Patient States:

Provisional Diagnosis:

Disposition:	*Recommendations for Investigation:*
☐ Home	☐ None
☐ Regular Work	☐ Routine
☐ Special Work (see remarks)	☐ Urgent (Safety Engineer also notified by phone)
☐ To _____	

Remarks:

_____ M. D.
Medical Department

INSTRUCTIONS

The value of this report is directly proportional to the completeness, accuracy and speed with which it is completed and forwarded. All entries, except signatures, should be typed, and all three copies kept together until "Closing Remarks" have been recorded by plant physician. Distribution of copies will then be made by the Medical Department to department manager and safety engineer. This report should be answered and forwarded by each individual concerned within 24 hours after its receipt. Only in this way can corrective action be taken promptly enough to prevent repetition of the accident.

MEDICAL DEPT. COPY

DEPARTMENT MANAGER: (Describe how accident occurred, including statements of witnesses. Include immediate cause, unsafe practices, if any, and action taken or recommended to prevent recurrence.)

Date _____ Signed _____
Dept. Manager

SAFETY ENGINEER:

Results of Investigation:

Action taken:

Date _____ Signed _____
Safety Engineer

PLANT PHYSICIAN: (closing remarks)

Date _____ Signed _____ M. D.
Plant Physician

to the appropriate department manager for further action.

On the face side of the report, at the bottom, are brief instructions as to the proper preparation and handling of this form.

"The value of this report is directly proportional to the completeness, accuracy and speed with which it is completed and forwarded. All entries, except signatures, should be typed, and all three copies kept together until 'Closing Remarks' have been recorded by plant physician. Distribution of copies will then be made by the Medical Department to department manager and safety engineer. This report should be executed and forwarded by each individual concerned within 24 hours after its receipt. Only in this way can corrective action be taken promptly enough to prevent repetition of the accident."

The department manager is in an excellent position, strategically, to make a prompt, on-the-spot investigation as to the immediate cause, unsafe equipment or practices, and statements of witnesses. He should also indicate what action he has taken or is recommending to prevent recurrence. The report is then sent to the safety engineer.

When the safety engineer receives the report, he has at hand all the background information he requires to make a thorough technical inspection and investigation of any mechanical or procedural hazards that may exist. The priority he gives to the investigation depends on the recommendation of the plant physician. He records the results of his inquiry and examination, and indicates the action he has taken to correct the hazard noted.

The report, with all three copies still intact, is then returned to the medical department, where the plant physician records the final diagnosis, any permanent disability, estimate of lost time if employee is still absent, and other remarks pertinent to the injury.

Cases arise where significant differences of opinion occur between the individuals concerned as to the cause of the accident, and especially as to the remedial measures to be taken. In such instances, the plant physician calls for a meeting with the department manager and the safety engineer, and attempt to work the problem out together. In so doing, the services of the technical specialists in the engineering and production divisions are freely utilized.

When adequate conclusions are reached, necessary corrective action is immediately initiated.

With the closing remarks complete, the plant physician then distributes appropriate copies of the report to the department manager and the safety engineer. Each of these will then have a complete record of the case. The plant physician retains the original copy of the report, for future reference.

Some judgment must be exercised by the plant physician in the use of this form. It need not be used for every trivial scratch or bruise, unless informal questioning reveals the existence of a definite safety hazard which may cause more serious injury. It must be used in all cases of death, serious injury and cases involving lost time.

This report has helped to impress upon the department manager his share and responsibility in the safety of and safety practices in his department. By becoming more safety-minded, and by impressing on his personnel the importance of safety, he can thus decrease the number and severity of compensable accidents in his department, and, as a result, increase production, efficiency and morale.

For the safety engineer, it provides a standard system of accident notification, and a system of priority rating for accident investigation, and provides him with full background material concerning each accident to be investigated.

For the plant physician, it provides a standard form, by the use of which department manager, safety engineer and industrial physician coordinate their efforts to remove accident hazards and provide a safer plant, with resulting benefit to all concerned.

Early Treatment of Ocular Injuries

DERRICK VAIL, M.D.,
Chicago

THE eye and the hand are the two most important members of the human body. When the eye is injured the potentialities of loss of sight are very great, and a person who loses his sight loses a great deal in health and happiness. Therefore treatment of ocular injuries should rank in importance with acute injuries elsewhere in the body. I shall try to give you some specific rules which may be of value in your work.

First of all, the treatment of lid lacerations: when lids are injured and the tissues split, deformities are apt to result unless the wound is approximated accurately and with skill. I was in charge of eye work in Europe, and such wounds were exceedingly common. The field surgeon, in the rush of the battlefield, was unable to pay meticulous attention to the details necessary to a good result, and plastic repair had to be done in this country.

When you see patients with lid margins lacerated it is necessary to clean the wound, then to approximate the edges of the wound, and sutures should be placed in such a position that there is a small inverted V which will in time smooth down. This sounds very trivial, but the function of the lid is dependent upon its margin. Injuries of the conjunctiva should be left to the eye surgeon.

Burns of the eye are relatively uncommon, much to our surprise, in the war and also in industry. Burns of chemical nature should be treated by copious irrigation of tap water or saline. The use of a chemical to neutralize acid burns is a fallacy, because by the time it can be put in it is too late.

Sometimes a small corneal laceration means a penetrating wound and a foreign body. It should be irrigated with saline; an antiseptic solution is instilled such as sulfathiazole 5%, which is excellent to have ready for any injury. The use of local anesthesia after injury is bad practice in my opinion; not only does this interfere with epithelization of the injury, but it is also likely to produce severe allergic reaction and sloughing of the cornea.

Corneal foreign bodies are most badly treated at first. Removal is not difficult. The ones I see removed have a ring of rust or other debris left behind which acts as a foreign body does and produces infection or irritation, and often ulceration. The eye should be cocainized thoroughly and removal should be done with a good loupe; and the rust by use of a dental bur. The after treatment is very important. Five per cent sulfathiazole ointment or penicillin ointment is all that is necessary. Local anesthesia is to be deplored. The eye is covered with a bandage and the patient told to return the next day. For pain, aspirin with codeine is usually sufficient.

Penetrating injuries of the eye are of course very serious and require the expert care of a trained oph-

Presented at the meeting of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS, Chicago, October 21, 1946.

thalmic surgeon. When the eye is opened by a flying missile, there is a release of intraocular pressure. The iris is prolapsed. I advise you to be careful. If you try to remove the iris, thinking it is a foreign body, you will do damage to the eye. It requires exact localization with the x-ray. Ordinary postero-anterior and lateral x-rays are of no use. We must know the size and shape of the foreign body and the exact location, because on these two factors depends removal; with the magnet, if magnetic; with forceps if not.

When the eye is contused after being struck with a blunt object or by explosion, as we saw many in the war, what occurs in the eye? The eye is a closed cavity containing fluid, and pressure applied to any part is equally transmitted to the interior. The amount of force to the front of the eye is transmitted to the interior of the eye. The most common injury is that the anterior chamber is filled with blood which obscures all possibility of recognizing deeper damage. Therefore you should beware of an optimistic approach. The eye should be bandaged, the patient should remain quiet and be sent to the ophthalmic surgeon.

Medical Departments in Small Plants

—Lay-Out, Equipment and Cost—

NATHAN MILLMAN, M.D.

WHEN a small plant decides to inaugurate a plant health program and to set up in-plant medical service, usually on a part-time basis, one of the problems faced is to construct and equip a suitable medical department. This was the problem in the inauguration of in-plant medical service in seven small plants in the Long Island City area of New York City.

The small plant medical department need not be as extensive or as complete as that in a large plant because it will not be used as frequently. The prime purpose of the small plant medical department is to furnish adequate quarters and equipment for the various procedures which are frequent and which can readily be conducted in the plant. The small plant utilizes the facilities available in the community, whenever it is necessary to conduct procedures which call for expensive apparatus (such as x-ray, elaborate physiotherapy or laboratory equipment). The small plant also usually fits the new medical department into its already existing facilities with a minimum of new construction or expensive equipment.

With a proper understanding of the function of a medical department,[1] a small plant can readily install an adequately equipped medical department which will serve its needs and yet will not be too expensive (the average cost of the fully equipped medical department in this group of seven small plants was about $1.00 per employee annually.)

A small plant medical department should be suitable for:

1. Adequate physical examinations including the simpler laboratory tests such as routine urine and hemoglobin determinations.
2. Adequate treatment of emergencies and minor illnesses.
3. Consultation service.
4. Adequate record keeping.[2]

It should contain enough space to allow for suitable privacy and should be comfortable (light, airy, quiet and adequately heated) and be suitably located in the plant so that it is readily available to employees as well as applicants, for employment. Its equipment should be adequate for the above procedures (Table 1).

TABLE 1.
SUGGESTED QUARTERS AND EQUIPMENT FOR A PLANT MEDICAL DEPARTMENT

A. *ROOM*

Approximately 1 square foot per employee—to be divided into treatment room, consultation room and examination room.
A bench for waiting should be supplied.
The department should be adequately lighted, heated, ventilated, clean and quiet and should contain a sink with hot and cold running water, a telephone and a toilet, if possible.

B. *EQUIPMENT*

1. Small desk and chair
2. Record file
3. Floor lamp (spot light)
4. Couch (with linen and blanket)
5. Folding stretcher
6. Enameled combination treatment table and instrument cabinet
7. Treatment chair with arm and foot basins
8. One additional chair
10. Soap dispenser and paper towel rack
11. Sterilizer
12. 1 basin
13. Scale, and height rod
14. Examining table, if possible
15. Supplies closet or wall cabinet
16. Eye charts (Snellen) and color charts—or Teleo Binocular
17. Infra-red lamp (optional)
18. Ultra-violet lamp (optional)

C. *SUPPLIES*

1. Thermometers, 2 mouth—1 rectal
2. Scalpel, safety razor and blades
3. Forceps—splinter, tissue, hemostatic
4. 6 clamps—3 small—3 medium
5. Scissors, bandage and surgical
6. Eye spud
7. Syringes—2 & 10 cc.
8. Hypo needles—assorted size
9. Suturing needles—assorted
10. Needle holder
11. Assorted bandages—gauze
12. Assorted adhesive—plaster
13. Cotton
14. Assorted sutures
15. Assorted splints
16. 1 Tourniquet
17. Wooden tongue blades and applicators
18. Test-tubes—1 dozen and test-tube holder
19. Alcohol lamp
20. Rubber gloves—¼ dozen
21. Finger cots
22. Several rubber catheters
23. Hemoglobinometer
24. Glass slides—1 box
25. Assorted chemicals (benzine, antiseptic solution, Benedict's solution, acetic acid, green soap and local anesthetic)

The cost of such a medical department will run anywhere from several hundred to several thousand dollars depending upon the desires of the plant, but the average cost will be less than $1.00 per employee annually (considered on a 10-year depreciation basis of equipment and construction).

The actual location of the medical department should be such that it is convenient to both office and plant staff and also to a source of water supply and toilet facilities, and should also allow for sufficient space and possible expansion (on the basis of approximately one square foot per employee but not less than a total of 100 square feet). Another factor to consider is the lack of noise. A medical department must be quiet so that proper examinations may be made and advice given.

Concerning the lay-out of a medical department, a small plant medical department should preferably consist of several rooms so that several activities can be carried out simultaneously. This is particularly advisable in view of the part-time nature of the medical service and the necessity of conducting as many activities as possible within a specified time. Thus, physical examinations by the physician and redressings by the nurse can be done simultaneously, if there are several rooms. However, if the space is not available, one room may be satisfactory, but will not be as convenient. Also, if space is at a premium the waiting room can be eliminated and a bench suitably located, substituted for it since, in a small plant, and with a proper appointment system, not too many employees will visit the medical room at the same time. It has been noted that in those small plants where space is at a premium, a suitable medical department can be constructed by re-arranging existing departments or replacing or decreasing plant storage space.

The following information describes the medical department in each of the seven plants above mentioned which were inaugurated by the Office of Industrial Health. This information is being presented in the following manner:

1. INDUSTRIAL MEDICINE, 15:6, 371-376, June, 1946.
2. INDUSTRIAL MEDICINE, 15:8, 491, August, 1946.

A. A brief description of the type of manufacture, plant size, number of buildings and floors in building, and location of medical department (See Table 2).

B. Pictures taken of the medical department location before installation.

C. Blueprints of the new medical departments which were installed.

D. Cost of the new medical department.

E. Typical pictures of the installed medical department.

Summary

A SMALL plant can install a medical department without too much cost or construction. The average cost of construction and equipment of a medical department of seven small plants in New York City was less than $1.00 per employee annually on a 10-year depreciation basis.

2. The small plant medical department need not be larger than two or three rooms although one room can also be made to do, if insufficient space is available. If available, one square foot per employee should be allowed for the entire medical department.

3. A good department in a small plant should consist of a waiting room, treatment room and combined consultation and examining room, appropriately equipped.

4. The equipment should be sufficient for all health procedures which can readily be performed in a small plant. All procedures requiring elaborate and expensive equipment, such as x-ray, physiotherapy or laboratory, should be performed outside the plant by using the community facilities. However, a small plant medical department can be equipped for performing routine physical examinations including urinalysis, hemoglobin determinations and the drawing of blood for routine serology; also treatments including simpler physiotherapy procedures using infra-red and ultra-violet apparatus. Equipment for consultations and good record keeping can easily be included.

5. A variety of floor plans showing the lay-out of small plant medical departments have been demonstrated.

6. The actual location and lay-out of each plant are dependent on individual plant conditions. The equipment, on the other hand, can be more or less uniform.

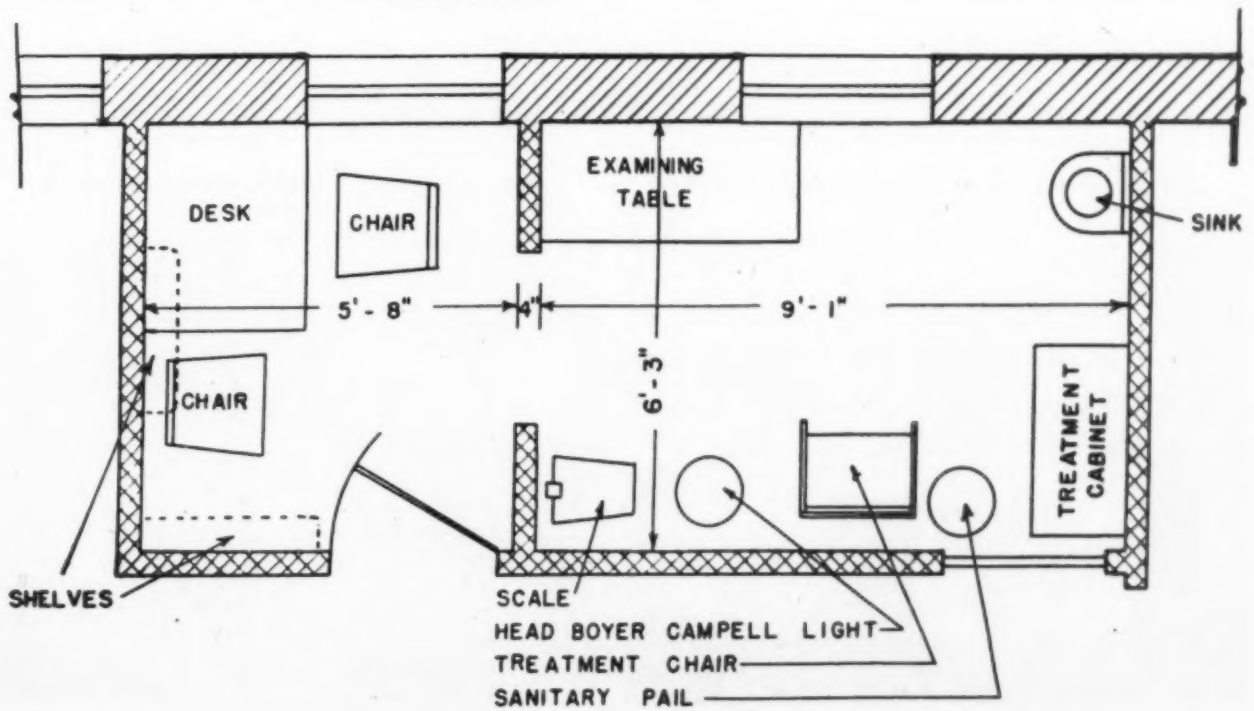
TABLE 2.

A. A BRIEF DESCRIPTION OF THE TYPE OF MANUFACTURE, PLANT SIZE, NUMBER OF BUILDINGS, AND FLOORS IN BUILDINGS, AND LOCATION OF MEDICAL DEPARTMENT

	Plant No. 1	*Plant No. 2*	*Plant No. 3*	*Plant No. 4*	*Plant No. 5*	*Plant No. 6*	*Plant No. 7*
1. Type of Manufacture	Porcelain Products	Printing	Paints	Food Processing	Amusement Machines	Chemical	Carbon Parts
2. Size	70 employees (has increased to 120)	125 employees	200 employees	225 employees	300 employees	350 employees	700 employees
3. Description of Plant	1 story 2 buildings	1 complete floor in a 4 story building	3 buildings 2-4 stories	5 story building	4 story building	4 story building	4 story building
4. Location of Medical Depart.	In office building near Main Entrance	Near the center of the floor	1st floor of Central Bldg.	3rd floor Central Bldg.	1st floor adjacent to Personnel Office	2nd floor adjacent to Personnel Office	In basement

PLANT NO. 1.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
Before picture—not taken	The present medical department was constructed as a temporary one while the plant was on war production and in the process of expansion. It is now starting construction of a more permanent medical department. However, the temporary medical department although small, was adequate for the purpose. (See Fig. 1a)	Equipment ..... $350 Medical Supplies ..... 125 Construction ..... 75 Total $550	After picture—Not taken because the Department was temporary



PLANT NO. 2.

B. Medical Department Location before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
See Fig. 2b	See Fig. 2a	Construction.....$600.79 Labor..... 52.40 Furniture..... 74.50 Medical Equipment.... 388.75 Total.....$1116.44 See Fig. 2d	See Figs. 2c and

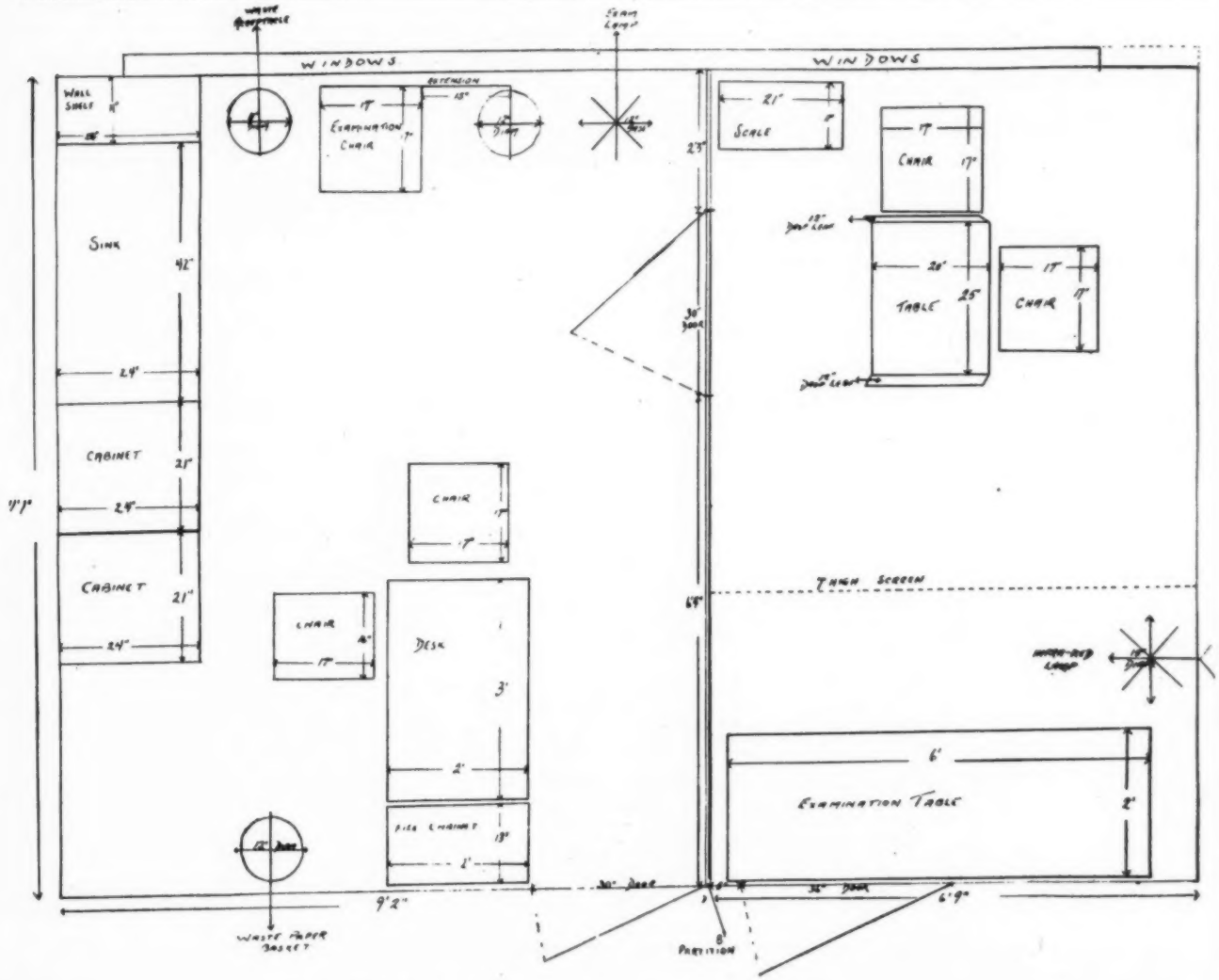


Fig. 2a. Floor Plan of New Medical Department.

Fig. 2b. Site of Medical Department before Installation.

Fig. 2c. Corner of Newly Installed Medical Department.

Cost of Capital Items		
Plumbing Cont.	$125.00	
Plumbing	14.80	
Iron and steel	6.24	
Electrical	105.00	
Partitions—doors, etc.	292.75	
Linoleum flooring	55.00	
Signs	2.00	
Total	$600.79	$600.79
Furniture	$ 74.50	74.50
Labor	$ 52.40	52.40
Medical Equipment		
Exam. lamp	$ 16.00	
Sterilizer	53.00	
Exam. table	27.50	
Towel holder for table	10.00	
Metal chair	37.50	
Scale	30.00	
Infra-red lamp	35.00	
Medicine cabinet	37.50	
Waste receptacle	7.50	
Cabinet sink	59.95	
Cabinet R. H.	34.95	
Cabinet L. H.	34.95	
Soap, towel and cup dispensers	4.90	
Total	$388.75	388.75
		$1116.44

Fig. 2d. Cost of New Medical Department.

Fig. 2e. Department Installed.

PLANT NO. 3.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
See Fig. 3b and 3c	See Fig. 3a	Construction $1485 Medical Equipment 1000 Total $2485	See Fig. 3d

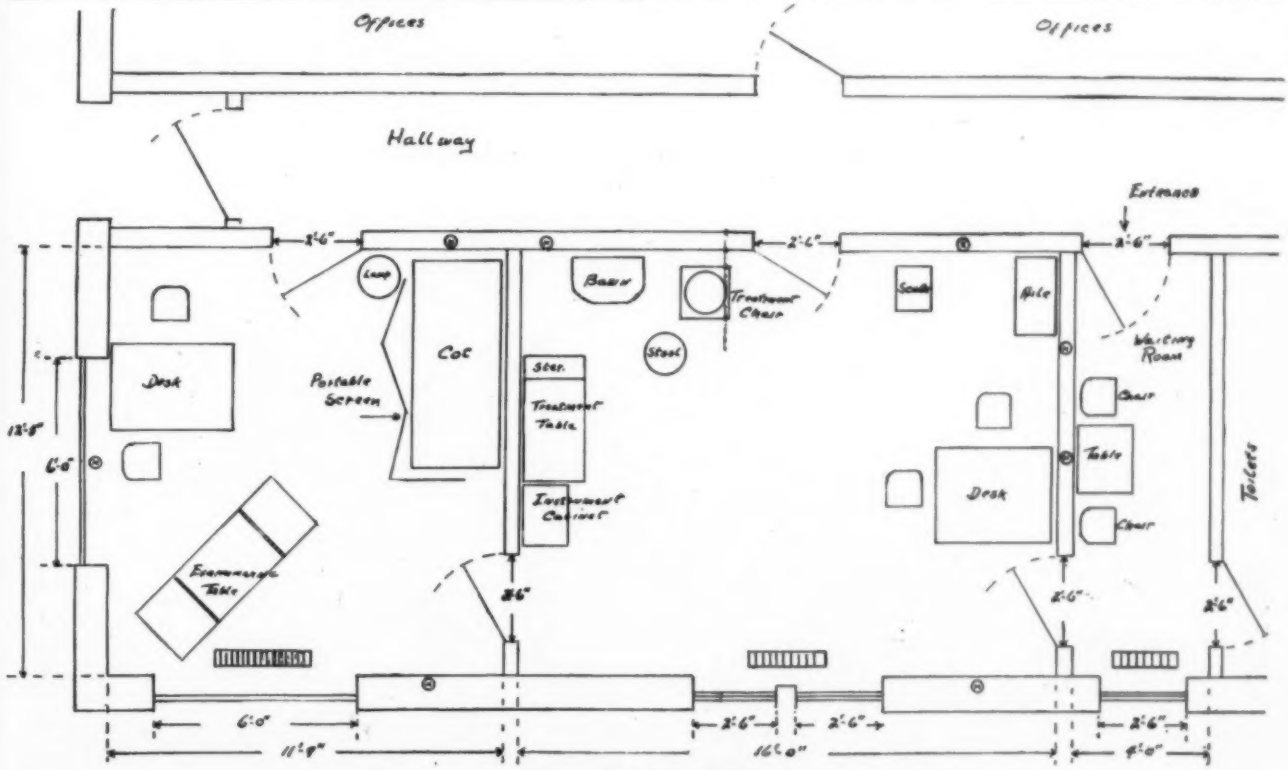
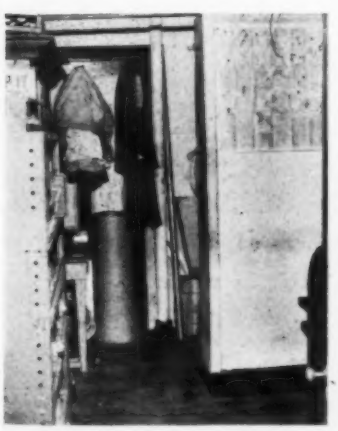


Fig. 3a. Floor Plan of New Medical Department.



Figs. 3b and 3c. Before Installation.

Fig. 3d. After Installation.

Plant No. 4.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
See Fig. 4c	*Note:* This plant was very crowded for space and they had to limit its medical department to one room. Because of the activity of the medical department since its inauguration, the medical department could now use additional space. See Fig. 4a	Construction.....$1800 Medical Department..... 800 Total.....$2600 See Fig. 4b	See Fig. 4d

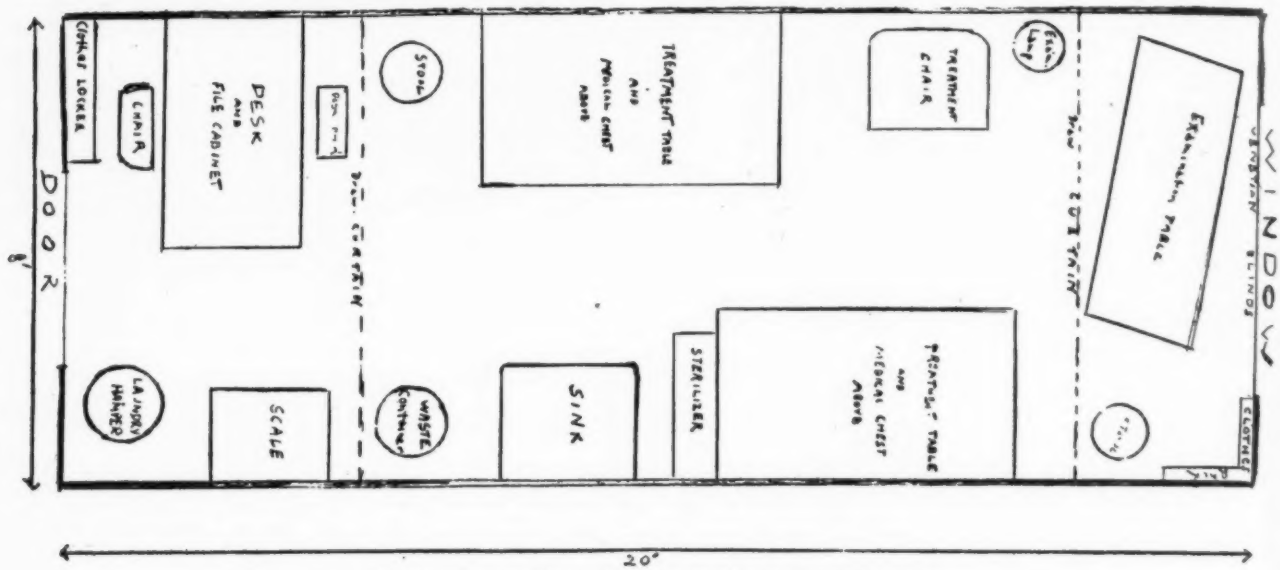


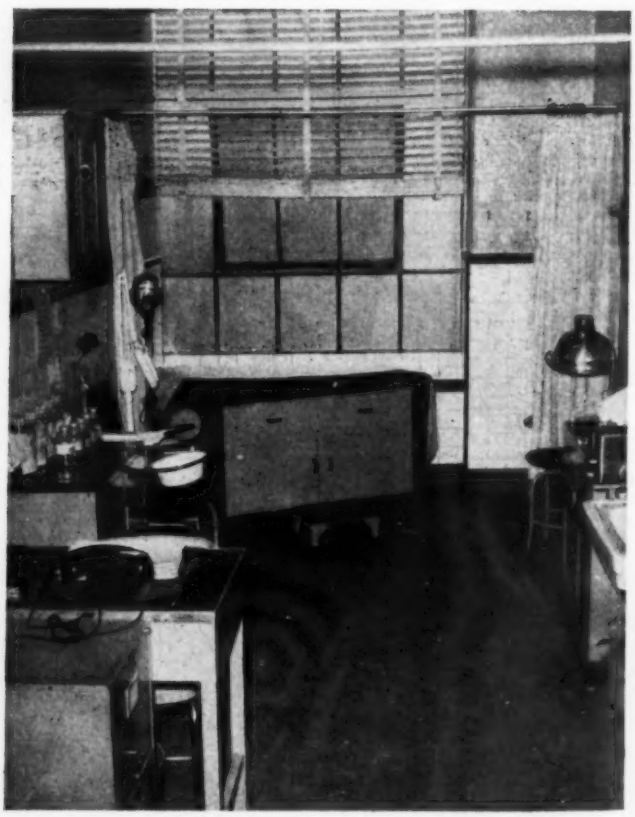
Fig. 4a. Floor Plan of New Medical Department.

Cost of Medical Department	
Construction	$700.00
Plumbing	700.00
Electrical	150.00
Linoleum	60.00
Tiling	200.00
Medical equipment	800.00
Total (approx.)	$2600.00

Fig. 4b. Cost.

Fig. 4c. Location in Which Medical Department was Installed.

Fig. 4d. Medical Department Installed.



Plant No. 5.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
This plant had a cubicle which it was using as a first aid room. (See Figs. 5a and 5b)	See Fig. 5d	Construction.....$ 723.13 Medical Equipment... 730.00 Total.....$1453.13 See Fig. 5e	See Fig. 5c

Fig. 5a. Before Installation. Cubicle used as First Aid Room.

Fig. 5b. Before Installation.

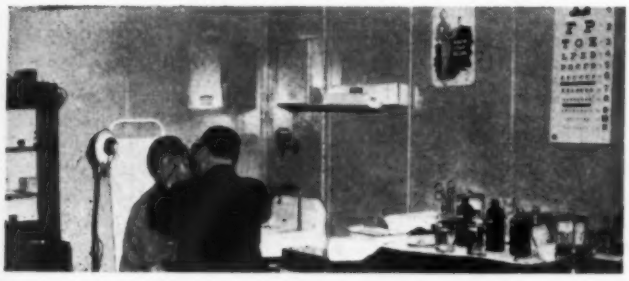


Fig. 5c. New Medical Department.

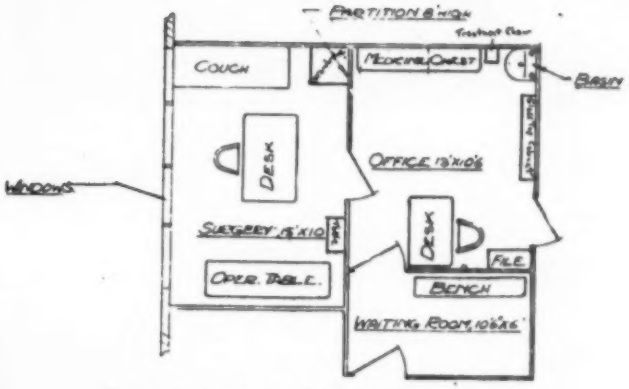


Fig. 5d. Layout of New Department.

Material used	$132.00	2 Desks	85.00
Labor	181.13	Swivel and straight chairs	55.00
Painting	225.00	Stethoscope and blood pressure apparatus	50.00
Plumbing	185.00	Scale, table, bed, waste baskets, lamps, surgical table, instruments	400.00
Medicine cabinet	50.00		
Supply cabinet	25.00	Total	$1453.13
Sterilizer	50.00		
Glass desk top	10.00		
Glass supply jars and bottles	5.00		

Fig. 5e. Cost of New Department.

PLANT NO. 6.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department		E. Installed Medical Department
See Fig. 6a	See Fig. 6c	Construction, 7 rooms	$2637.00	See Figs. 6b and 6d
		Electrical Work	300.00	
		Painting	250.00	
		Medical Equipment	480.00	
		Total	$3667.00	

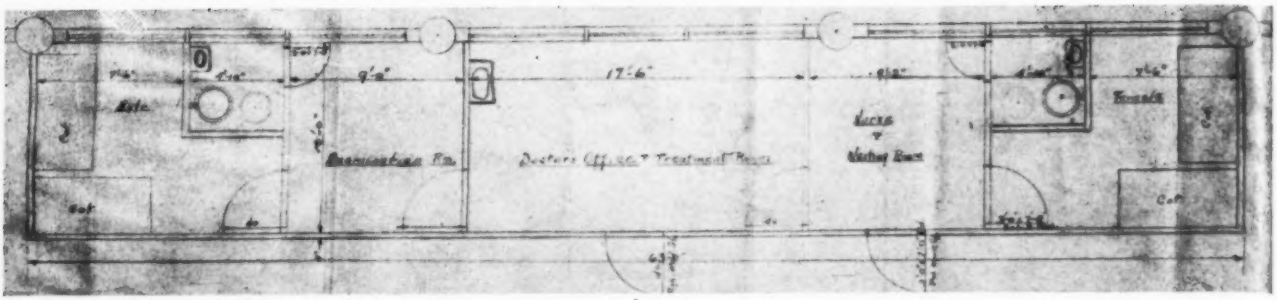
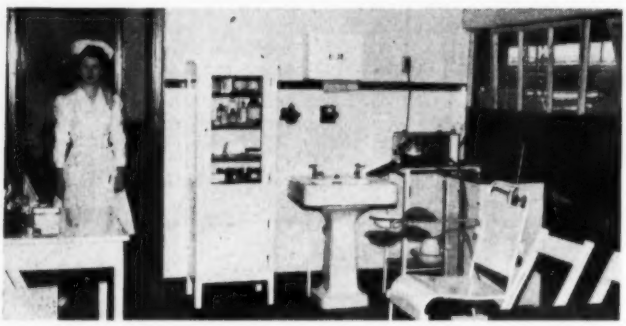


Fig. 6c (above). Floor Plan of New Department.

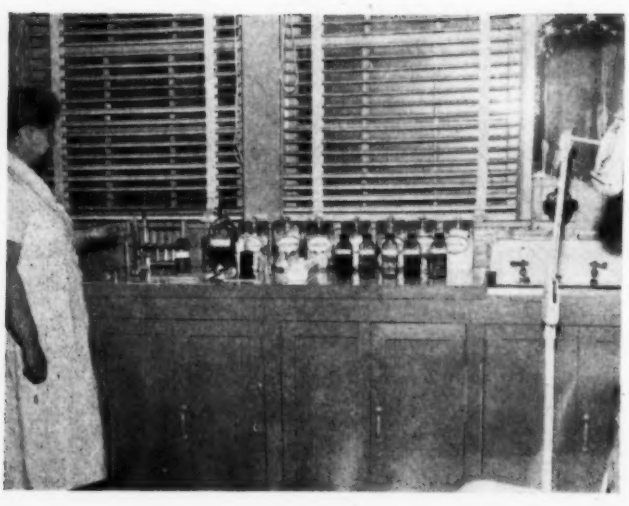


Figs. 6a and 6b (page 179). New Medical Department Location before and after Installation.

Fig. 6d (left). Installed Medical Department.

PLANT NO. 7.

B. Medical Department Location Before Installation	C. Plan of New Medical Department	D. Cost of Medical Department	E. Installed Medical Department
This plant had a first aid room prior to the inauguration of program	See Fig. 7c	Building and Medical Equipment ..... $ 922.00 Medical Supplies ..... 128.00 Total $1050.00	See Figs. 7a and 7b



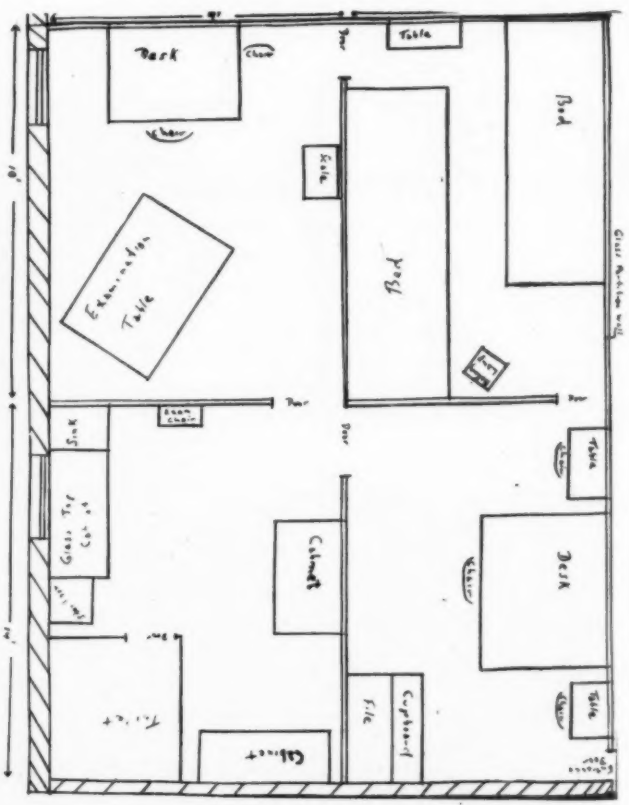


Fig. 7c. Layout of New Medical Department.

Fig. 7a (left, above), and Fig. 7b (left below). The New Medical Department.

The Post-Cholecystectomy Syndrome

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ALL agree that the best results following cholecystectomy are in those patients with cholelithiasis, especially if there has been a history of typical biliary colic. Even in these, removal of the stone bearing or calculous gall-bladder is followed in from 2 to 15% of all cases[1, 2] by persistent or recurring right upper quadrant pain, often associated with digestive tract upset, chills and fever, or mild jaundice. Occasionally these attacks are as severe as those originally suffered by the patient and for which cholecystectomy was performed. After the removal of non-calculous or functioning gall-bladders, particularly if there has been no history of colic, the incidence of postoperative symptoms is even higher, 30 to 40%. This paper deals particularly with those patients with symptoms following cholecystectomy for cholelithiasis.

Every surgeon who has removed many gall-bladders has seen unsatisfactory results, even when preoperative studies have been carefully done, technique has been faultless and other diseases have been excluded as the cause of the pain. In such cases the symptoms may be attributed to "biliary dyskinesia"[3,4] or dyssynergia. It is simpler to refer to them as the "post-cholecystectomy syndrome." Before discussing dyskinesia, it is appropriate to consider the more common causes of poor results. The majority of these can be attributed to errors in diagnosis or in surgical technique.

Numerous statistical studies have been made in an attempt to determine the frequency of symptomless gall stones. Reports from large series of autopsies[5] indicate that stones in the gall-bladder are found in "about 10 to 15% of all women in the 40 to 50 year age group with an increasing frequency reaching 40 to 50%"[6] at ages 70 to 80. Many of these individuals have had little or no symptoms of gall-bladder disease. The most common type of symptomless stone is the solitary one, round or oval in shape, large in size, so frequently found in an otherwise normal and functioning gall-bladder. These stones are made up of cholesterol and are thought to be the result of some disorder in fat metabolism. The frequency of symptomless gall stones deserves mention to remind us of the necessity of excluding other pathology in the explanation of right upper quadrant pain, particularly if the clinical history is that of indefinite symptoms in an emotionally unstable individual. Peptic ulcers, inflammatory and neoplastic lesions of the colon, appendicitis, and diseases of the right kidney are perhaps the disorders most commonly overlooked in patients who also have cholelithiasis. Many surgeons believe that calculous gall-bladders should be removed even if they are causing no symptoms, and this view is supported by impressive evidence. Eighty to 90%[7] of carcinomas of the gall-bladder occur in association with gall stones, and this disease has a 100% mortality rate. The surgical mortality from cholecystectomy in good risk patients should not exceed 1 or 2%, which is probably lower than the incidence of carcinoma in neglected calculous gall-bladders.

Even when pre-operative studies have revealed no other explanation for right upper quadrant pain, careful exploration at the time of operation is still advisable. Many disagreeable postoperative symptoms are due to the presence of associated pathology in the biliary tract. The liver, common bile duct and head of the pancreas should be palpated or visualized before the gall-bladder is attacked. Similar attention should be given to the right kidney region, to the stomach and to the colon. It is advisable in female patients to palpate the pelvic organs. Tubal infections, especially of gonorrheal origin, may produce peritoneal inflammation in the right upper quadrant. These and other less common pathological findings may coexist with cholelithiasis, and the surgeon is better prepared to deal therapeutically and psychologically with a post-cholecystectomy syndrome if he feels confident of the presence or absence of other intra-abdominal lesions.

In connection with the all-important problems of surgical technique and judgment, considerations of the cystic duct and of the common bile duct may be discussed separately. So-called biliary colic can be due to several different types of bile tract pathology or pathologic physiology. The theory that typical colic is due only to the passage of a calculus is not tenable, as it occurs when calculi are immobilized as well as when there are no calculi present. It now appears that the post-cholecystectomy syndrome may be due to infection or stone, or both in the remnant of the cystic duct when this is ligated some distance from the common bile duct. It is beside the point to argue whether the pain comes directly from this duct remnant or is due to biliary dyskinesia caused by spasm of the sphincter of Oddi as a result of the cystic duct pathology. Cole and Rossiter, in 1938[8] called attention to the importance of the cystic duct as a cause of symptoms. More recently, Gray and Sharpe[9] have reported a series of 44 cases of post-cholecystectomy syndrome in which reoperation revealed dilated remnants of the cystic duct, and in the majority of these there was marked evidence of recent inflammation. In 18 of them, calculi were found. They concluded that in performing cholecystectomy an attempt should be made to remove all except a very short segment of the cystic duct.

The frequent variations in the position and length of the cystic duct have been emphasized repeatedly. Flint,[10] for example, reported that in 200 consecutive autopsies, he found that the external biliary apparatus conformed to textbook descriptions of the normal in only 69 or 35%. Fear of injury to the common duct undoubtedly has influenced many surgeons to ligate the cystic duct at or very near its entrance into the gall-bladder, especially when adhesions in the gastrohepatic ligament render difficult the dissection and adequate visualization of the ducts. Examination of many surgically removed gall-bladders reveals that often the neck of that organ in addition to the entire cystic duct is left in the patient. Unless we perform more painstaking dissections, and carefully ligate the cystic duct closer to the common duct, it would seem that we are inviting further trouble in a certain percentage of patients.

Pathologic changes in the common bile duct certainly explain many of the cases of post-cholecystectomy syndrome. Traumatic strictures resulting from technical errors are all too common. It often requires meticulous care to avoid injury to this structure, especially if the cystic duct is very short or lies parallel to it. No one should attempt gall-badder surgery without complete familiarity with the anatomy of the region and the types of anomalies which occur so frequently. Many common duct injuries result from accidental clamping after distortion of it by traction on the cystic duct. Others occur from attempts to clamp and ligate a bleeding vessel which

Presented at the meeting of the AMERICAN ASSOCIATION OF RALWAY SURGEONS, Chicago, October 21, 1946.

may retract to a position below or behind the duct. In defense of the surgeon it must be said that strictures of the common duct may occur from inflammation alone. This may result from a chemical choledochitis due to reflux of pancreatic juice, which has been found not only in the common duct[11] but even in the gall-bladder. In fact there is more and more evidence accumulating to indicate that cholecystitis often starts from chemical irritation rather than from bacterial invasion.[12] Whipple[13] reported three cases of common duct stricture following operation at which time he was sure that there was no injury of the duct. The fact remains that the large majority of strictures of the common duct are found in patients who have previously undergone biliary tract surgery. Walters and Heim[20] state that 80 to 90% are due to surgical trauma. Strictures following tube drainage of the common duct are comparatively infrequent, which would indicate that this structure can withstand considerable insult from foreign body irritation without significant narrowing.

An overlooked or recurrent common duct stone as a cause of the post-cholecystectomy syndrome is well known. It is unlikely that a true calculus will form within a few weeks although a putty-like granular debris can recur and block the passage of bile. Even the most careful search may overlook a small stone in the common duct. Because of this, some have advocated the instillation of radio-opaque material and x-ray visualization of the ducts at the time of operation. The difficulty in the interpretation of such films and the operative delay have prevented this procedure from becoming popular.

What is less well known than the significance of choledochal stone is the fact that the primary infection in biliary tract disease may be in the common duct. In such cases, removal of the gall-bladder does not give relief unless the duct is also opened and drained. When the pathologic changes in the walls of the common duct are marked or are out of proportion to the gall-bladder disease, drainage by a tube should be employed. This should be continued for weeks or months or until follow-up duct visualizations by lipiodol injections through the tube show a return to normal size and function.

The indications for opening or drainage of the common duct are still debatable, as shown by the statistics from various surgical clinics. Some surgeons believe only 7 or 8% of ducts require opening. Others explore 50 or 60% of them.[14] The incidence of choledocholithiasis in opened ducts is reported from 15 to 85%. It would seem that the surgeon who finds that 85% of opened ducts contain stones is considering a palpable stone as his main indication for choledochostomy. There is little doubt that the incidence of choledocholithiasis varies with the duration of the biliary tract pathology and the age of the patient. In most of the larger clinics at the present time the common duct is opened in about one-third of all cases. Sanders[14] opened the duct in 13% of his cases and found stones in 70% of them. Lahey[15] opened, 44% of the common ducts in his clinic and found 18% contained stones. The latter reported that no jaundice had occurred in 39% of those patients with common duct stones. Each surgeon must be guided by his own experience and his own observations of the post-cholecystectomy syndrome to decide when to open the common duct. No hard and fast indications can be given. The surgical mortality rate is approximately doubled[14] when common duct drainage is added to cholecystectomy, but this is probably due to the fact that more extensive biliary tract and liver damage already exists in those patients where duct opening is clearly indicated. Walters[6] states that "about 20% of patients who have undergone cholecystectomy are left with some residual damage in the liver, pancreas, or bile ducts which may continue to produce flatulent dyspepsia and sometimes pain in the right upper quadrant." The post-cholecystectomy syndrome will be less common in the practice of those surgeons who, when operating on the bile passages, are guided by a sound understanding of the pathology and pathologic physiology involved.

The question of peritoneal adhesions as a cause of postoperative pain has, I believe, been pretty well answered in the minds of most discriminating surgeons. During the first few weeks postoperatively, symptoms may be caused by adhesions to the gall-bladder bed, producing distortion of the duodenum, pylorus, or colon. These symptoms should gradually subside. Adhesions will not explain severe colicky pain or bouts of chills, fever, and jaundice, especially if these symptoms persist or recur months after cholecystectomy.

After excluding other causes, there remains the question of biliary dyskinesia or the disturbance of the neuro-muscular mechanism regulating the secretion of bile as a cause of the post-cholecystectomy syndrome. This explanation is still somewhat in the theoretical stage, but the accumulated evidence would indicate that it is probably the most common cause, at least of the mild and temporary symptoms which disappear in a few weeks. It has long been thought that there was some sort of reciprocal autonomic nerve innervation which governed the filling and emptying of the gall-bladder, synchronizing the motility of this organ with the opening and closing of the sphincter of Oddi, thus controlling the flow of bile and pancreatic juice into the duodenum. This theory of bile excretion is questioned by Boyden[16] and others. At the present time it appears that the removal of a functioning gall-bladder, whether it contains stones or not, alters the sphincter mechanisms and the function of the common bile duct. The duct dilates, at least temporarily, presumably in an attempt to assume the function of the gall-bladder. An irregular or sluggish flow of bile through the duct is thought to result, and bile stagnation or retention may explain the symptoms of colicky pain and so-called "indigestion." If, however, the gall-bladder has gradually become functionless by disease or stone blockage, the common duct and sphincter mechanism have undergone a physiologic adaptation, and the post-cholecystectomy syndrome is less common. When the gall-bladder is long functionless or absent, colic may be due to sphincter spasm initiated by infection or stone anywhere in the extra hepatic bile passages. The term "Odditis"[17] has been used to refer to such a disorder of the sphincter of Oddi muscle.

REGARDLESS of the exact physiological explanation, what can be said of the treatment of the post-cholecystectomy syndrome? In general, the medical treatment is the same as that which can be used before operation. The emotionally unstable, hyper-irritable female patient is the most difficult to treat. Often there are associated dysmenorrhea or menopausal symptoms, together with constipation or other evidences of dysfunction of the colon. Lahey[18] reported a series of 65 patients who had constipation and non-visualization of the gall-bladder. After the constipation was successfully treated, the gall-bladder could be visualized in 44% of them. A bland non-irritating diet with small frequent meals may give relief. Alka-

lies are indicated in cases with gastric hyperacidity. Instillation of magnesium sulphate by duodenal tube apparently still has its advocates. It is doubtful if the various cholagogues are of actual value other than by their effect on elimination. If the colic is severe morphine may be necessary, but it often gives only temporary relief, and by aggravation of sphincter spasm it may actually prolong the attack. In such cases nitroglycerine when given with morphine may be more effective than either drug alone. Other antispasmodics such as atropine, amyl nitrite or theophylline are worth a trial.

In spite of medical treatment and time, some patients with the post-cholecystectomy syndrome will not improve and reoperation is indicated. Colp[1] estimates this number at about 8%. It is difficult to arrive at exact statistics as these patients so frequently consult another surgeon for their second operation. Laparotomy may fail to reveal the cause of the symptoms. I know of one woman who has been operated upon three times for severe biliary colic following an original cholecystectomy for stones, and each time no pathology has been found. Hypertrophy or spasm of the sphincter of Oddi may be the best explanation for such cases, and section of the sphincter has been advocated to overcome spasmodic contracture of it. Colp[20] devised a special enterotome by which the muscle can be sectioned through the common duct. The transduodenal approach carries the risk of persistent duodenal fistula, a serious complication.

There is still much to be learned about the physiology of the extra hepatic bile passages and further study may reveal the cause of some of the cases of post-cholecystectomy syndrome. Until then we can reduce their incidence by more thorough pre-operative study and by improvements in our surgical technique.

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SEE the item on page 12 regarding the joint meeting at the Palmer House, Chicago, on May 13, of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY and the CHICAGO SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY.

Industrial Sanitation

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WE ARE offering here at the Georgia School of Technology a course of study entitled "Industrial Sanitation," designed to acquaint the young men who will assume various managerial and engineering positions in our industries throughout the Southeast with the rudiments of employee health. It is hoped that through these lectures the students will come to know that there are certain "man-made" diseases for which they themselves may be responsible unless preventive measures are taken, and that this information will give them a sufficient amount of the technological "know-how" to enable them to shoulder this responsibility. By this educational process, considerable savings in time, energy, and, in some instances, actual lives can be effected. Greater emphasis is being placed on management's responsibility for employee health, and a graduate who has in addition to his fundamental training this surplus will undoubtedly be a premium to management.

So many plants are too small to warrant the employment of full-time sanitary engineering personnel and must rely on the "over-time" or perhaps "premium" services of some one already fully engaged in some operational capacity.[1]

Better relations with labor and government would undoubtedly be realized. To date, 20 states in the union, including Georgia, have occupational disease laws, and most unions are now demanding better working conditions. Another worthwhile dollar-and-cents savings in addition to those in labor relations will be that of decreased insurance rates. A program such as this should make possible effective "stop-at-the-source" as well as "early diagnosis" of health hazards possible. In addition to the actual financial saving to industry itself, the community as a whole would greatly profit because the service of the existing sanitary engineering facilities could be selectively expanded to previously poorly covered or new and deserving fields by virtue of the assistance received from understanding managerial personnel. Thus arising the philosophy of "preventive medicine" wherein the sanitary engineer would cure the hazards after they cause damage while the plant engineer and manager, by early diagnosis and preconsultation, would prevent the hazards from arising.[2]

From the included lecture outline it can be seen that a total of 36 meetings over a period of 12 weeks are undertaken and that the initial weeks are devoted to acquainting the student with the official and non-official agencies that he can depend upon for detail technical assistance; also acquainting him with certain usual statistical perimeters commonly encountered in the valuation of specific employee health conditions. In addition, the fundamentals of vital statistics, workman's compensation, industrial insurance, as well as absenteeism, are covered in such a nature as to present the national and local aspects of the employee health problem in proper perspective.

The following weeks are devoted almost in entirety to the specific technological phases of industrial hazards which one might expect to encounter, covering all but stressing the more important ones to the area served by the school. For example, W. W. Weir, Chief Sanitary Engineer of the Georgia State Department of Health, has been emphasizing for sometime the need to acquaint managerial personnel with the im-

portance of industrial water supply and in particular the vital health implications of the cross-connection between an industrial supply and a community supply has occasioned the addition of lectures covering Industrial Water Supply.[3]

Georgia has a good number of granite-sheds wherein silicosis, a serious and now compensable disease, is encountered. Approximately two weeks are devoted to the understanding and control of industrial dusts. Inasmuch as almost 60% of Georgia's income is from textile manufacture, the temperature and humidity controls required in a textile plant and their effect on the working environment are certainly worthy of consideration. Also some attention is paid to the air-conditioning requirements of hospitals, public buildings, and the like.

The newer plastics and the inorganic and organic chemicals essential to their development have brought in with them many new and serious hazards, and for the most part the effects of many of these substances are little understood. Most manufacturing concerns of metal products use chromic acid and some form of degreasing agent, such as CCl_4. These substances are very toxic and the student is advised to be on the lookout for them. Experiences in the Brunswick, Georgia, shipyards during the war with the manufacture of Liberty ships emphasize to us the importance of teaching about the effects experienced from the inhalation of metal fumes resulting from welding operations and the discomfort perpetrated on the welders in the form of metal fume fevers.[4] The City of Atlanta has several storage battery plants in which lead poisoning could become a hazard. This, in addition to possible hazards arising from relatively scarce exposures such as radioactive material, x-ray, mercury, etc., is discussed in detail.

Community sanitation and plant sanitation are intimately tied together and are vitally important to the plant production. Particular emphasis is given to "in-plant-feeding" inasmuch as modern practice is to feed the employees at noon. Good sanitation lectures include information on proper washing facilities which are so essential to the elimination of dermatosis, at present the greatest single cause of industrial disease. With stream pollution abatement legislation currently popular in many states and with the possibility of national legislative attention to this subject, the different types of stream pollution to be expected ranging from food-processing wastes to metal process pickling wastes are covered in a very general sense.

The final weeks are used to present specific methods of control in terms of personal protective equipment, substitute materials, as well as ventilation. Some emphasis is placed upon the intra-plant functioning of industrial sanitation and noteworthy the entire problem is approached from that idea of prevention and not from the medical treatment standpoint. Some attention is given to purchasing control liaison.

We are very anxious to see the results of such a training and to date we have had some very helpful comments. Mr. J. J. Bloomfield, Industrial Hygiene Division, U. S. Public Health Service, comments on the work to date as follows: "The subjects are quite inclusive and cover the field very well indeed. My only thoughts in the matter are with reference to the recipients of this course. It sems to me that such a course should be given not only to sanitary engineers but to all engineers. As a matter of fact, the other engineering students have more ned of such a course than do sanitary engineers, since the former are apt to be found in industry to a much greater extent than the latter. I hope that I shall see the day when every engineering student is given a course in industrial hygiene during his undergraduate days, so that when such a person is confronted with health problems in industry, he will know something about them and where to seek assistance."[5]

It is the author's belief that in most every phase of engineering and management in industry there is some marginal infringement on health. Furthermore, it is his considered opinion that this health infringement is the responsibility of the engineer and manager involved, and that by giving him the necessary knowledge to recognize the hazard, to know where to go for help, and to know how to receive and apply expert advice, he can shoulder the responsibility. It is only fair to bear in mind that any work or process that can in any way affect the worker, affects also the health and welfare of the entire community.

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INDUSTRIAL SANITATION

Week	*Subject*
1	a. Purpose
	b. Organization Available Services
	c. Vital Statistics
2	a. Absenteeism
	b. Workman's Compensation
	c. Industrial Water Supply & Treatment
3	a. Dusts, General consideration
	b. Pneumoconiosis
	c. Etiology of Silicosis, Asbestosis
4	a. Dust Collection and countings
	b. Evaluation of Hazards
	c. Effects of Abnormal Temperatures Tropical Climates
5	a. Effects of abnormal physical conditions—pressure, shock, and repeated motion
	b. Noise, Illumination
	c. Air conditioning of public buildings, street cars, cars, hospitals, etc.
6	a. Mid-semester Quiz
	b. Noxious Gases, General Considerations
	c. Inorganic (acid and alkaline mists)
7	a. Organic gases
	b. Measurement
	c. Evaluation of Hazards
8	a. Toxic metals, etc. (lead, Cd, Hg., metal fume fevers).
	b. Radio active substances—X-Ray
	c. Community Sanitation
9	a. Plant Sanitation
	b. Dermatosis
	c. Industrial Wastes
10	a. Stream Pollution Abatement
	b. Control, general consideration
	c. Personnl Protective equipment
11	a. General ventilation and local Exhaustion
	b. Air measurements
	c. Fundamentals of Design
12	a. Movie—Industrial Hygiene Survey
	b. Intra-Plant Functioning of Industrial Hygiene
	c. Final Examination

DR. HARRY J. JOHNSON, assistant clinical professor of medicine, New York Post Graduate Medical School, addressing the Greater New York Safety Council, March 28: "If industry would make available complete diagnostic facilities to its employees so that the family physician would have no difficulty in obtaining whatever laboratory and x-ray help he needed in arriving at an accurate diagnosis, many lives would be saved and an inestimable amount of time conserved. The treatment of most conditions is quite obvious after the diagnosis is accurately made. Industry need not worry itself about therapeutic measures so long as diagnostic procedures are provided. Health examinations of 10,000 unselected persons disclosed 48% to be suffering from conditions for which they could well have been under their doctor's care. Such persons obviously were not capable of maximum production."

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When is a Shrimp an Oyster?

IN FEBRUARY, 1945, one of the Grant Stores sold a fried shrimp platter for 65 cents. But, said the OPA, shrimps are seafood, and Grant's price for seafood had previously been established, when it sold an oyster stew for 45 cents. From which it appeared that even if the store wanted to put lobster on the menu, it would have to go for the same 45 cents. But nobody could convince Grant that this made sense. The OPA fined the store $75. Grant wouldn't pay. Then the agency brought suit for $2,500. The courts tried to please everybody by substituting a fine of $6.50. Grant wouldn't pay that either. Time passed, lawyers got so they couldn't stand the sight of an oyster—and last month, two years and about 50,000 words later, the U. S. Emergency Court of Appeals unanimously upheld the company's position and declared the OPA regulation illegal. *A shrimp is not an oyster stew."*

This is not irrelevant. It illustrates (1) the governmental agency habit, so carefully fostered under the New Deal, of definition by "directive," and (2) the equally obnoxious habit of arbitrary enforcement where any such definition may be in question. The pertinency here is in connection with the efforts of the Department of Labor toward assuming control of industrial hygiene activities as "matters affecting the industrial worker," and what will happen to those activities if and when control is obtained. The Department's present efforts are being pursued under the shibboleth of "safety."

Two bills have appeared in the present Congress, both entitled "To provide for cooperation with State agencies administering labor laws in establishing and maintaining safe and proper working conditions in industry and *in the preparation, promulgation, and enforcement of regulations to control industrial health."*

The Senate bill (S. 101) is the same as S. 1271 on which hearings were held in the last Congress, amended, however, to contain less mention in its text of industrial hygiene except by implication.

The House bill (H.R. 475) puts forward again the subject matter of H.R. 525 which was before the previous session. H.R. 475 is more temperate in language than its predecessor, but the text repeats the words of the title, affirming specifically that *one of its purposes* is to enable the Department of Labor "to cooperate with State agencies administering labor laws in establishing and maintaining safe and proper working conditions in industry and *in the preparation, promulgation, and enforcement of regulations to control industrial health hazards."* And the amounts allotted to the States from the five million appropriation are, as before, to be based in part on *"the special safety and health problems in industry."* All this with a view "to encouraging more effective control of hazardous conditions."

The bills are alike in that they are the same old perennials, watered down as the result of committee hearings in previous Congresses so as to "get by" this one. But they are enough different to suggest that the difference was planned to involve a compromise "in conference" after their passage that will fasten down the lid of their name without disturbing the contents of their hidden "innerds" of purpose. The name is "safety"; S. 101 states that it may be cited "as the 'Industrial Safety Act.'" Both bills *seem* to have "safety" as their chief objective. But . . . .

Experience with the legislative enactments of the last 15 years has warned the American people to look beneath the surface, and a small excursion under the covers here will be enlightening. There is no question that the Departments of Labor, both State and Federal, intend to, and will, undertake industrial hygiene activities if these bills are enacted. This may be realized from the record. For example, the report of the Thirteenth National Conference on Labor Legislation held in December, 1946* says that "Industrial hygiene and sanitation in places of employment are matters affecting the industrial worker and consequently are the responsibility of state labor departments." In this same report, Resolution No. 8 reads: "that in furtherance of centralized administration of laws for the protection of workers, this Conference recommends that industrial hygiene activities be centered in the agencies of the States which administer labor laws, and that any funds appropriated by the Federal government for assistance in this field be made available to State departments of labor. . . ."

If these declarations of intention are not enough, there is the report from the Committee on Education and Labor accompanying the amended S. 1271 in the 79th Congress. This document** makes the definite averments (1) that *"the full burden of maintaining safe and healthful working places,* therefore, *falls upon the State Departments of Labor,"* and (2) that "Any plans submitted under Section 3 of the bill, therefore, may properly embrace any activities which come within the scope of authority vested under the agency administering state safety laws. These activities may include

*U. S. Department of Labor Bulletin No. 85.
**Report No. 1210, Calendar No. 1233, 2nd Session, 79th Congress, April 18, 1946.

such matters as the prevention of accidents, the removal of toxic fumes and gases and control of other occupational exposures."

Elsewhere in this report there is the interesting statement: "In hearings before the subcommittee, some controversy developed over the possibility that as originally proposed, the bill might have permitted a Federal agency to attempt to force a reassignment of industrial health and sanitation programs now administered by health departments to State labor departments. As rewritten by the committee, the bill eliminates any possibility of such a situation occurring. The primary purpose of the legislation is to assist States in reducing industrial accidents. If any State wants to include in the program features of an industrial health program, the state is free to do so under the language proposed but the decision is left entirely to the States."

As a disclaimer of ulterior motive, however, this is not even persuasive. Compare it with the Conference recommendation above quoted that *"industrial health activities be centered in the agencies of the States which administer labor laws"*—a recommendation made *"in furtherance of centralized administration* of laws for the protection of workers."

The foregoing evidences of double intent are convincing; these bills are drawn to seem other than they are, to be enacted for ostensible purposes of "safety" but to be *interpreted* in terms of health and hygiene. If this is not the case, there will be no objections on the part of their proponents to such revision of the language as will remove all suspicion. For they must remain suspect so long as industrial health appears in their texts or in their intentions. Safety is a proper objective, and if five million dollars will reduce the number of industrial accidents by a proportionate figure, its expenditure will be worth while. But the equivocal wording of both bills, particularly H.R. 475, makes it more than probable, indeed, makes it certain, that a part of this money will be allotted for industrial health activities by Departments of Labor. And the "decision" on *how much* will be so used, which "is left entirely to the States," will be influenced, of course, by the amount of the allocation.

The predecessor bills, inspired by the Department of Labor to get itself into control of industrial health and hygiene, have been discussed in these columns.*** The arguments urged against them have lost none of their force; they are as cogent now as before:

"1. Industrial hygiene is a health matter, not a labor matter.

"2. Industrial hygiene activities are now being handled, *and excellently handled,* by the Federal and state public health officers, through their Divisions of Industrial Hygiene, and their sanitary, engineering, laboratory, nutrition and other public health facilities.

"3. The present effort to extend the scope of the Labor Department's authority to the control of industrial health hazards and to 'special safety and health problems in industry,' in so far as health and health hazards are concerned, disregards the obvious fact that *such extension would duplicate existing facilities.* This duplication is completely unnecessary—so patently unnecessary as to label the efforts to bring it about bureaucratic and political in the worst sense in which these terms are critically employed, to say nothing of the fact that the proposal involves a wholly needless expenditure of taxpayers' money.

"4. Health departments have the ability to carry on health and hygiene services *impartially.* This is inherent in their professional status, for this status not only demands the ability but also imposes the duty to be impartial. No physician, no engineer, will risk his reputation by being anything but impartial. This, however, cannot be said of those whose tenure of position depends upon the good will of pressure groups; the official careers of such are mosaics of carefully-graded preferences and partialities."

We are in complete agreement with the proposal that everything possible to be done toward reducing the risks of all kinds of employment should be done. To the extent that the present bills are aimed at such results they deserve careful and sympathetic study. But first they should be amended to omit all references to industrial hygiene and industrial health, so as to confine their purpose to the single objective of accident prevention. This for the reasons above noted, which are fully sufficient to require this amendment. Unless the bills are so amended they should not be permitted to become law.

But there is still another basis of objection to these bills in their present form. It stems from the bureaucratic interpretation of the term "safety" as including the industrial hygiene activities now being so well done by the Federal and State Health Departments. This is the Labor Department's way of insisting that a shrimp is an oyster. The American people last November made it plain to the agencies of government that the New Deal habit of indirection was unpopular; that the high-official pastime of saying one thing while meaning another was being overplayed; that they, the people were *not* "too damn dumb" to realize they were being fooled and lied to "again and again and again. . . ." The habit, however, was strong; H.R. 475 and S. 101 are eloquent that it is still hard to break.

In common with the millions to whom the present high taxes are too high,**** we urge in general that all bills appropriating taxpayers' money be as forthright and definite and specifically phrased as the bills imposing the taxes; and that there be the same honesty in governmental expenditure of the money paid by taxpayers as is insisted upon by the government in the payment of it by the taxpayers.

And in particular we urge that these bills, H.R. 475 and S. 101, be withheld until they are honestly and unequivocally presented. For if the Department of Labor is *honestly* interested in extending the scope and effectiveness of industrial health and industrial hygiene it will join in support of a bill *to appropriate the necessary money for the U. S. Public Health Service to use in that behalf.* But, from examination of the record it is clear that the Department of Labor is honestly interested only in centering "industrial health activities" in the agencies which administer labor laws.

***See "Lay Politics in a Medical Field," INDUSTRIAL MEDICINE, 13:5, 406-408, May, 1944, in re H. R. 4371 and S. 2800; "Again and Again. . . ." INDUSTRIAL MEDICINE, 14:2, 106-108, February, 1945 in re H. R. 525; and "Let's look at the Record." INDUSTRIAL MEDICINE, 14:4, 288, April, 1945, in re H. R. 525.

****See Gallup Poll on the subject, *Chicago Daily News,* March 28, 1947.

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First Aid for Chemical Eye Injuries

P. M. VAN ARSDELL, M.S.,
Chicago

DURING the war, all ophthalmologists as well as industrial medical officials suffered woefully (though necessarily) from lack of exact information on chemicals used in industry, their toxic properties, and their effect on human tissues—including eyes. Endless inquiries relative to toxic hazards to eyes during these last years were channelled through the Joint Committee of Industrial Ophthalmology. The Joint Committee in turn (by virtue of its various contacts) was able to get information for all parties concerned and their problems. We were well aware all the time that a much more complete, exact and detailed compilation of facts was needed. It is with pleasure that the Joint Committee is sponsoring this new and brought-to-date paper, "First Aid for Chemical Eye Injuries." A tremendous amount of work went into its preparation. This information given here is to be fully developed at the request of the Joint Committee and published as a Manual with the addition of extensive tables and charts. Further notice of the Manual will appear later. A number of national organizations are eager to publish it when available. Comments from readers and further discussion of this vital subject are urged.

—HEDWIG S. KUHN, M.D.,
Secretary of Joint Committee on Occupational Ophthalmology, (American Academy of Ophthalmology and Otolaryngology and the Section on Ophthalmology of the American Medical Association.)

[This work of MISS VAN ARSDELL has not been edited or changed by the Joint Committee and is the expression of her intensive research into the literature and work of those interested in chemical eye injuries.]

ALL FOREIGN material which enters the eye is irritating and may be dangerous depending on the nature of the substance. The first rule for treatment consists of immediate copious irrigation directly in the eyes with plain water for at least five minutes. Prompt and plentiful water irrigation will save the sight of many eyes, and any one can and should institute this treatment at the time of the accident.

All chemicals entering the eye are immediately and potentially dangerous. Of those which contact the eyes directly, the concentrated acids and alkalis are most damaging; while for the lower concentrations the alkalis or alkali-producing salts are far more dangerous to sight than the acids and acid-producing salts. Alkalis penetrate deeply through a continuous chemical action with the tissues. The main reaction produces soap which continuously dissolves the eye tissue, and the longer it remains in contact, the deeper the penetration causing more extensive damage. Should solid particles remain after irrigation, a trained person should remove them as soon as possible.

There are a number of rules to be kept in mind after the eyes have been thoroughly irrigated, and in order not to undo the benefits of a thorough irrigation the following points should be learned by everyone.

1. Untrained persons *should not* attempt any further treatment than the irrigation. Many well-meaning individuals at the sight of a person in great pain naturally wish to do all they can to alleviate the suffering, and if an eye kit containing argyrol or yellow oxide of mercury ointment is at hand, attempt medication which can be damaging to the patient.

2. The best procedure after on-the-scene irrigation is to get the injured person to the plant dispensary or first aid room if such is provided, and, lacking these facilities, to the nearest eye physician. This should not be delayed, for in all chemical contacts, speed and promptness of treatment are the essence of sight preservation.

3. No ointments should be used on burns of any type (chemical, rays, or others) as they are impossible for the physician to remove and hinder his work at a later time.

4. Do not attempt any neutralization such as acids for alkali contacts or vice versa. In the first place valuable time will be consumed in preparation of such solutions, and secondly it has been proved many times over that they are far too damaging to a normal eye to be effective when damage has already occurred.

5. Whenever any disturbances of vision occur such as dimness, blurring, double vision, temporary or partial blindness an ophthalmologist should be consulted as soon as possible with full particulars ready as to type of work, presence of chemicals, or heat or any other pertinent facts with regard to possible chemical or light exposures.[23a]

MISS VAN ARSDELL is Secretary of Benson and Associates, Inc.

Discussion

EVERY day an appalling number of persons temporarily or permanently lose their sight through accidents. The joy of vision is tacitly accepted by the great majority who are not aware that their sight may be lost as the result of an accident. In industry alone, nearly 8,000 were blinded in one or both eyes in 1945. Authentic figures are apparently not available for the total number of eye accidents that occur, as a search has shown the number to range from 80,000[47a] to over 300,000[16, 34, 45] per year.

Chemical eye injuries have become an increasingly serious problem throughout many industries which are using more chemicals of a greater variety than ever before. In one plant alone the incidence of chemical eye injuries has more than doubled in a period of four years. Records were kept during the period from 1942 to 1945, inclusive, and the following table summarizes the findings. Dispensary cases are those treated in the plant, and referred cases are those severe enough to warrant further treatment by an ophthalmologist.

TABLE 1.

Year	Dispensary Cases	Referred Cases
1942	663	85
1943	583	69
1944	926	82
1945	1394	97
	Total 3566	333

From the foregoing table kept consistently, it is easily recognized that the incidence of chemical eye irritations and burns is far greater than the statistics would indicate.[26a]

Chemicals are responsible for a fairly large number of eye injuries either by direct contact with the material, or as a result of accumulation of the chemical within the body through inhalation or absorption through the skin.

The presence of chemicals in the working area is a potential eye hazard for every worker—whether he cleans the test-tubes or directs research. Splashes, dusts, or vapors may at any time accidentally contact the eyes, with damage to the lids, conjunctiva, or cornea; and, in the case of cumulative exposure, damage may occur to the optic nerve, the brain or the blood stream, which eventually may cause many types of disorders of vision.

The most easily recognized injuries are those occurring when splashes or dusts enter the eyes. For both the injured worker and for those who wish to help him, only one cardinal first aid rule should be followed:

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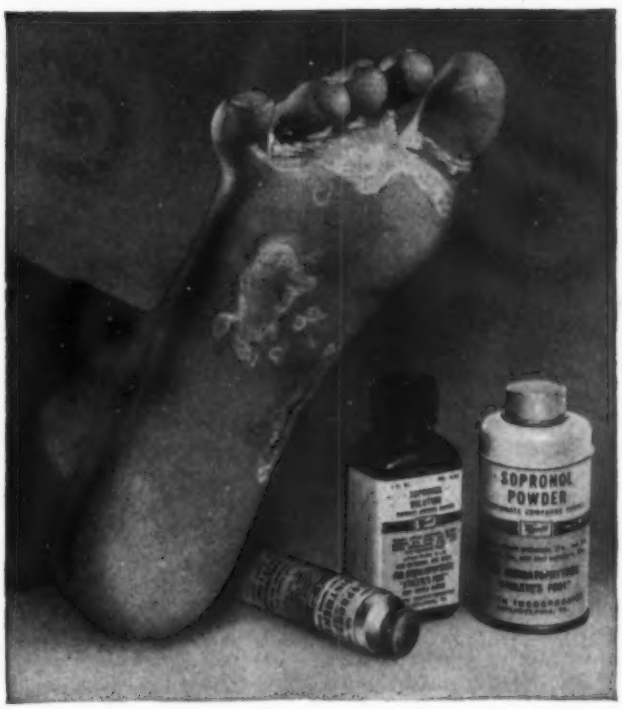

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Promptly wash the eyes with plenty of water for at least 5 minutes.*

After such treatment the remaining course of procedure is to see an ophthalmologist as soon as possible.[19]

Throughout the literature, the majority of the number of qualified persons who have written on the subject emphasize this procedure. Experimental animals in large numbers have given their eyes to prove these rules, and case histories of eye accidents due to chemical contacts reported in medical journals throughout the world have proved their efficacy.

Prior to 1920, it was customary to recommend neutralizing agents such as mildly acid solution for alkali burns, and mildly alkaline solutions for acid burns *before* any other treatment was given, and this is still practiced at present, but only *after* the prompt and thorough washing has been done. Then it is given, if necessary, by the physician or other qualified persons. According to many reports on the subject, the best results, and that means the saving of some of the sight of the eye, are accomplished by the continuous water washing before any other treatment is applied.

From a purely theoretical standpoint, it would seem to the chemist that neutralization should be the proper course, but in actual practice such a procedure adds considerably to the pain, damage and irritation of an already highly inflamed, extremely sensitive area.[6a, 26a] Even when undamaged, mildly acid or alkaline solutions do not feel too good to the eyes, but when they have been injured such a procedure immediately following an accident is comparable to pouring mild acids or caustics on open flesh wounds. Removal of foreign material by means of water washing leads to less permanent damage than use of chemical neutralization. A further advantage is gained by using water in that it may be speedily and effectively applied and no time is wasted as it would be if it were necessary to prepare the neutralizing solutions of the proper strength.

The involuntary reaction of the injured person when foreign material reaches the eye is first a spasmodic closure of the eyelids, followed almost immediately by a tendency to rub the eye. Both of these reactions must be combatted swiftly when chemicals reach the eyes. Dilution by water requires that the eyelids be held open by force if necessary and no rubbing as that may work the chemical further into the recesses of the eye, making it necessary to use instruments to effect complete removal.

Ordinary dusts or particles nature removes in her own way by means of tears, but when such chemicals as acids, alkalis, corrosive salts or organic chemicals enter the eye, the penetrating action is so swift that nature must be augmented by use of plenty of water to wash away the damaging material. Also the pain caused by such entry is extremely great and the quick dilution helps to alleviate the distress. When the lids clamp shut as they often do from the spasm caused by the pain the hands must be used to hold open the eyes so that effective washing may take place.

Relation to Chemical Contact

THE lids, the conjunctiva, and the cornea are the external portions of the eye which can be damaged by the entry of chemical splashes or dusts. Corrosion of any of these portions is extremely painful,[7] and unless promptly cared for may lead to serious damage.

When the outer portions of the lids are injured, swelling and closure may result. However, when chemicals are splashed into the eyes and there is a raw surface in contact with the conjunctiva, an adhesion of the lids and conjunctiva may occur unless proper precautions are taken during treatment of the chemical burn. This difficulty has been met with particularly when lime burns occur or when any caustic is splashed in the eyes and the two raw surfaces come together.[20] Medically, this condition is known as symblepharon.

The conjunctiva is the mucous membrane of the eye. It lines the inner surfaces of the eyelids, and also covers the forepart of the sclera and cornea. The portion lining the inner surfaces of the eye lids is thick and opaque having a considerable blood supply which is responsible for the red appearance when the lid is everted. The part lying over the eyeball is loosely connected to the bulb of the eye and is thin, transparent, and has only a small number of veins. Over the corneal portion, the conjunctival layer is epithelium only. Lymphatic tissue is liberally distributed over the conjunctiva ensuring a constant lubrication of the fore part of the eye.

Whenever this conjunctival layer is injured either by scratching or by chemical reaction, considerable pain ensues, and the reaction is to rub or to tightly close the eye. Conjunctivitis or irritation of the conjunctival layer occurs when foreign substances enter the eye causing a reaction of the tissues.

The cornea is the transparent portion of the eyeball through which the light penetrates to the deeper mechanism of the eye. In the case of chemical splashes, the thin conjunctival layer is easily penetrated by chemical reaction allowing the corrosive chemical to contact the cornea. Chemical action on the cornea may be extremely serious if not fatal to the vision as the action of the chemical may be either one of clouding the cornea to the point of opaqueness, or the cornea may be so severely corroded that the vision is either completely destroyed or extremely distorted. When such chemicals as lime and ammonia attack the cornea, penetration to the inner chambers of the eye is rapid and blindness may result from destruction of the inner structures.

Inhalation or absorption of certain types of chemicals affects the eyes in such ways as abnormal sensitivity to light, dimness of vision, and partial or total blindness which may or may not be permanent.[6, 23, 34]

As has been discussed, the eye is so constructed that the overlying conjunctiva and lids form a constantly bathed protection for the eye, but when this coating is contacted by strong chemicals for seconds only, this outer protective layer is penetrated and damage to the visual organs occurs. Permanent damage is controlled by three factors:[11]

1. Strength and character of the chemical.
2. Length of time before initial treatment.
3. Type of initial treatment.

Chemicals in Relation to Eye Damage

VAPORS, fumes, dusts, and splashes are all potential eye irritants whether they are derived from acids, bases, salts, or organic compounds. For splashes and dusts, the effects are immediate, while those from fumes and vapors may be cumulative, although it is difficult to make a sharp demarcation.

ACIDS: Concentrated acids such as sulfuric, nitric, hydrofluoric, mixed acid, acetic and picric withdraw water from the cells, and unite with the cellular proteins forming acid albuminates.[11] The reaction is immediate and very painful as the heat of tear dilution causes severe burning with great destruction of the eye tissue.

Cosgrove and Hubbard,[11] in presenting their study

*Refs. 1, 3, 5, 8, 10, 11, 14, 17, 20, 21, 23, 24, 25, 26, 26a, 28, 29, 30, 31, 32, 35, 36, 40, 44, 46, 47, 51, 53.

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on the effect of water washing of acid burns in contrast to neutralization, have shown the following effects from acids of varying strengths when they are placed in the eyes of rabbits. Table 2 summarizes their findings:

TABLE 2.[11]

Acid	Conc. &	Treatment	Results
H_2SO_4	95%	None	Death from brain penetration
H_2SO_4	95%	Neutralization after 10 secs. with 2% $NaHCO_3$	Death from brain penetration
H_2SO_4	95%	Washed after 10 secs. with plenty of water	Scarring of cornea
H_2SO_4	50%	None	Scarring of cornea
H_2SO_4	50%	Neutralized after 10-15 secs. with 2% $NaHCO_3$	Scarring of cornea
H_2SO_4	50%	Washed with plenty of water	Normal eyes for all but one after 2-3 days. Only one of group showed opaque cornea
HNO_3	68%	None	Destruction of eyes
HNO_3	68%	Neutralized immediately with 2% $NaHCO_3$	Destruction of eyes
HNO_3	68%	Water irrigation immediately	Marked scarring of cornea, but no destruction. After 15 secs. of HNO_3 contact, all eyes destroyed in spite of any treatment
HNO_3	30%	Neutralized by 2% $NaHCO_3$	100% of all eyes treated, degenerated
HNO_3	30%	Washed only	40% loss of eyes, 60% permanent corneal scars
HNO_3	20%	None	Marked corneal scarring
HNO_3	20%	5-20 secs. contact	60% cleared with either water or 2% $NaHCO_3$, but the water treated eyes cleared 2-3 days sooner than neutralized eyes

Highly concentrated acids usually produce some opacification with perforation of the globe or extensive symbelpharon due to the contact of raw surfaces produced when the conjunctival layers are burned. The milder acid burns tend to recover uneventfully. As the concentration af acids is lowered, it has been found that the corneal epithelium has a highly protective effect against the penetration and damaging effects of acids. In a study of the pH levels at which eye damage occurs it was found that for certain acids such as tannic and tungstic at high pH were capable of producing lesions because of the greater protein affinity of the anion.[13] It was also shown that the following acids increase in the order shown in affinity of the anion for protein—hydrochloric, acetic, metaphosphoric, sulfosalicylic, picric, tungstic, and tannic. The maximum lesions produced by each are essentially the same. From these studies it was also determined that certain specific features of acid eye burns contrasted markedly with those produced by alkalies.[13]

1. Slower penetration and sharper demarcation of the lesion.
2. Little tendency for the corneal epithelium to slough off.
3. Little tendency to show exudate or leukocytic infiltration of fibrinous iritis.
4. Little evidence of selective involvement of blood vessels.
5. Marked tendency of the relatively opaque cornea to heal.
6. A clinical course that is predictable within a few hours after injury.

These generalizations were determined with pH ranges from 1 to 9. As a rule the larger or higher molecular weight anions tend to penetrate less than the smaller or lower weight group. Definitive studies of this type are an aid in later treatment following first aid, and as so little data has been available on any but the most common acids, these experiments help to define the extent of damage that can be expected upon accidental eye contacts with the less common acids.

ALKALIS: Alkali contacts present a much more difficult problem as the injury to the eyes is more extensive and intensive, as well as more rapidly destructive especially in dilute solutions. Alkalis combine with cell fats and albumins forming alkali albuminates and soaps.[11] They penetrate much deeper into the epithelium and cause the tissues to die. As the action is extremely rapid, any treatment may not aid in preserving the vision.

The severity of alkali burns depends only slightly on the nature of the cation. The factors influencing the extent of the lesions are the concentration of the alkali,[20] the duration of contact, the pH of the solution, and the penetrability. Generally sodium, potassium, and calcium hydroxides produce a porcelain white opacification of the cornea immediately after exposure. The final outcome with regard to sight for any of these is poor. The potassium hydroxide produces even more severe reactions than the sodium. The duration of exposure may naturally be prolonged if dusts of lime or lye lodge in the folds of the eye and are not removed. In this event the corneal opacities become progressively worse as there is no lessening of the concentration of the irritant, and the particles act as "feeders" to the irritation. Heat is also produced when concentrated alkalis or lime enter the eye, however lacrimation tends to lower the temperatures. In treatment, surface irrigations with water should be instituted immediately after the contact in order to prevent the development of corneal lesions. Speed in treatment is paramount as the chances of retaining sight are poor in any event.

Throughout the literature[6a, 6, 23, 27, 34, 26a] a number of tables have been presented by numerous authorities showing the extent and type of damage to be expected from chemicals and contacts with compounds or inhalation of vapors. The notable exceptions in such tables are the lack of data on metallic and non-metallic salts which are in constant and increasing use throughout industry. These salts based on the reactions they produce on the skin contact can be as damaging to the eyes as the acids and metals from which they are derived. A generalization, based on knowledge of reactions on skin contacts, would seem to apply even more specifically to the damage to be expected on eye contacts as the continuous moisture present on the eye

TABLE 3.

Alkali	Conc. %	Treatment	Results
NaOH (11)	40	None	Degenerated eye followed by death
NaOH (11)	40	Neutralized with 2% Acetic acid	Degenerated eye followed by death
NaOH (11)	40	Washed with plenty of water	50% treated-cloudy cornea; 50% degenerated eyes
KOH (20)	10	None	Opacities in a few minutes
NaOH (20)	5	None	Opacities in a few minutes
NaOH (20)	2	None	Perforation of cornea in 7 days
NaOH (20)	0.8	None	Transient opacity for 3 days
NH_4OH(11) (50)	28	None	Cornea destroyed
NH_4OH(11)	28	Neutralized with 2% Acetic acid after 1 min.	Cloudy cornea
NH_4OH(11)	28	Water washing after 4 min. contact	Transparent cornea
NH_4OH(11)	28	5 minutes contact any treatment	Permanent scarring
NH_4OH(20)	10	None	Devastating lesions, corneal ulcer healing in 18 days, leaving densely opaque cornea
NH_4OH(20)	7	None	Opacity for 14 days, only slight residual clouding
NH_4OH(20)	3.5	None	Transient corneal opacity for 3 days
$Ca(OH)_2$(20)	25	None	Opacities within a few minutes

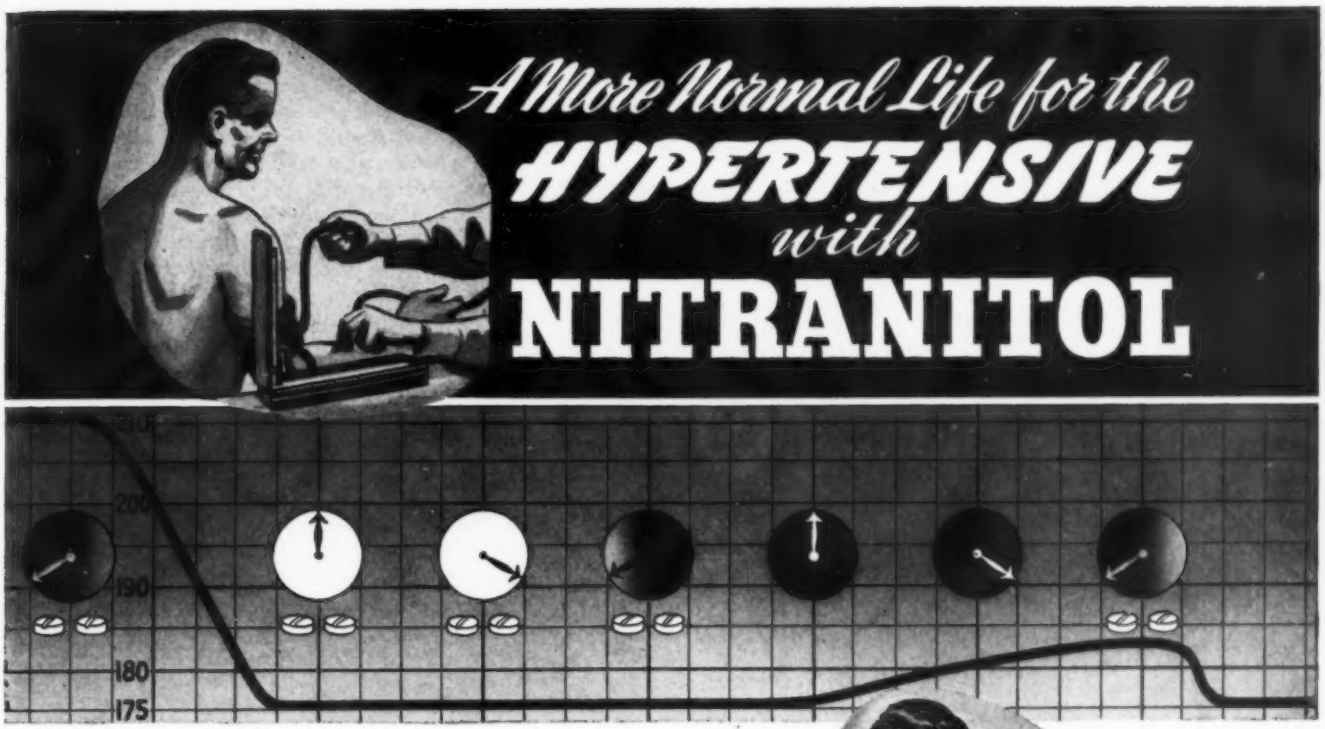

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TABLE 4.

Compound	Skin Reaction	Expected Eye Reaction
Chloride salts of Ammonium Aluminum Antimony (4) (12) (15) Bismuth Calcium Cobalt Copper Iron Nickel Lead Strontium Tin Zinc	Solutions are astringent and drying. Dry salts are hygroscopic and may produce burns. Antimony, copper, nickel, and tin and zinc produce itching and burning followed by the development of dermatitis	Irritating from acid reaction, concentrated solutions or crystalline salts may produce corrosion and burning of eye tissues. Conjunctivitis and corneal lesions can be expected from those producing dermatitis and skin burns
Arsenic	Absorbed through the skin. Low concentrations produce inflammation and later pigmentation with eczema	Highly irritating to mucous linings of eye area
Barium	Eczema and cyanosis, irritating to sweat glands, may bleach hair and eyebrows	Highly irritating, conjunctivitis and corneal lesions might result from dry salt contact
Cadmium (38)	Irritation and inflammation. Ulceration occurs in nasal septum on inhalation	Irritation of cunjunctiva, prolonged contact might damage cornea considerably
Mercuric (corrosive sublimate)	1-5% solutions produce irritation, drying, and corrosion. Absorption from the intact skin may be sufficient to produce general poisoning	Highly irritating on initial contact with even low concentrations. Mercuric salts have a high protein coagulating power hence the eye might be permanently clouded even on slight contact with a highly concentrated solution
Mercurous	No reported effect	Might produce a slight irritation. However mercurous salts are practically insoluble, and effects would be negligible
Nitrate Salts of Al, Bi, Ca, Cu, Co, Fe, Pb, Mg, Ni, K, Na, Sr, Ba, Cd, and Hg	Astringent and drying in high concentration in crystalline form. May produce dermatitis if contact is prolonged	Irritating and may produce conjunctivitis
Silver (18) (41) (43)	Burns skin and mucous tissues turning them gray and finally black after exposure to light. Silver compounds under the skin may cause gray to black skin coloration	Produces burns on eye tissues which may penetrate very deeply. When silver salts enter the body silver may be preferentially deposited in the whites of the eyes changing the color to mouse gray

area is even more conducive to dissociation of the ions than that of the skin which in comparison is relatively dry.

Aluminum chloride, antimony chloride, and other halogen salts have a strongly acid reaction on contact with moisture, hence the eye damage, in addition to that caused by the metallic ion, will also be in proportion to the amount of acid ions released in the eye tissues when the eye moisture is contacted.

Such salts as sodium cyanide, calcium acetate, potassium, sodium or ammonium sulfide in solution show an alkaline reaction; the damage to be expected on eye contacts with salts of this type would tend to follow the general pattern of weak alkali solutions as discussed previously. For the latter sulfide salts, in addition to the highly alkaline effect, the free hydrogen sulfide would also produce the light sensitivity and other irritation commonly encountered with low concentrations of this compound.

For either the acid or alkaline type of salt the reaction due to the pH of the solution should not be as great as that of the purely acid or purely alkaline contacts. However the other compounds produced by the dissociation reaction would not only add their effect but also could enhance the irritation produced by the acidity or alkalinity of the stronger ion in solution. A further fact which may also markedly influence these effects is that particles of these salts when lodged in the eye tissues may be difficult to remove and the "feeder" action of such particles react in the same way as that discussed under alkaline effects. Table 4 shows the salts which may be expected to be irritating to the eyes, although little work appearing in the literature corroborates this theory which is based solely on the skin reactions which have been fairly exhaustively studied.

Sulfate salts act as astringents and irritants[15] to the skin. Cobalt and nickel cause dermatitis. The eye reactions can be expected to follow this general pattern, conjunctivitis occurring in those producing dermatitis and extreme irritation and burning from those salts have astringent and irritating effects on the skin. Zinc sulfate has been reported to cause conjunctivitis.[15]

Halogen salts follow the same general pattern as those reactions outlined for the chlorides only with the possible exception that as the molecular weight of the halides increases,[52] the solubility also decreases.

Carbonate salts with the exception of the alkali metals are fairly insoluble. On the skin they produce a drying effect, the alkali and alkaline earth salts react as strong bases, hence the effect on the eye contact would parallel that for the lower alkali concentration previously discussed.

Chromates,[2] either dusts or vapors, on the skin produce dermatitis of an ulcerative type known as "chrome holes." On contact with eye tissues, irritation, conjunctivitis, irritation of the mucous membranes lacrimation, chemical burns, and eyelid inflammation are produced. Generally the immediate reaction is not so serious, but vapors, dusts, and sprays from the chromates, in view of the fact that contact is over a prolonged period, are in daily contact with these tissues and in many instances has produced all of the above reactions. The length of time necessary for such manifestations depends largely upon the degree of susceptibility of the individual.

Sulfide salts on the skin in high concentration loosen the hair and soften the skin in much the same manner as alkaline solutions. In the eyes the effect is one of alkali combined with hydrogen sulfide which produces a high sensitivity to light and conjunctivitis.

As soon as eye contact with any chemical occurs, water washing should be the rule as promptly as possible. Following the washing a visit to the ophthalmologist should be insisted upon, as no chances should ever be taken with the eye sight. As a further aid in preserving sight an accurate description of the type of contact should be given in order to aid the doctor as much as possible in instituting the correct treatment. In this way many complications may be avoided.

For convenience, the tables have been divided into three groups, inorganic, organic, and miscellaneous. The eye reactions have also been set forth, as far as information is available into internal, to cover the more immediate effects of contacts; external, to cover a number of reactions which seem to more specifically affect the lids; and the chronic or permanent effects, which occur either quickly or are long delayed as a result of continuous inhalation, or absorption of the chemicals. Damage to the eyes may be caused by inhalation, ingestion, or contact. With many of the organic and a number of the inorganic compounds the effects in the beginning are due to vapors or dusts entering the eyes from the atmosphere, but the more chronic and serious reactions result from

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inhalation of the vapors and gradual absorption from the lung tissues over a considerable period. Many chemicals act too swiftly for the ultimate damages to the eyes to be determined, especially on ingestion, but the others manifest themselves very dramatically at the beginning by their effect on the optic nerve.

In some groups such as the halogenated hydrocarbons, certain interesting conclusions may be drawn showing, especially in the gaseous series such as methyl chloride, methyl bromide, and methyl iodide, that the toxic reaction tends to become more pronounced as the molecular weight increases; however, it is difficult in most instances to make any generalizations as all of the possible types of damage have either not been tabulated in the literature or are presently unknown. Many of the chemicals have been adopted for general use so recently that studies of chronic effects have not or cannot yet be evaluated.

Generally, whenever new compounds are introduced, careful checks for eye damage should be maintained. While animal studies may not indicate damage, the differences in body chemistry may be sufficient for toxic effects to be noted in the higher species and be completely absent in the lower.

The purpose of this article has been to stress the importance of the use of water in copious amounts as the most effective first aid measure. This simple procedure is effective and will minimize the chances of blindness and much extended duration of pain when chemicals are accidentally contacted in the eye area.

The list of chemicals known to affect the eyes is constantly growing. Physiological studies of industrial chemical contacts are continuously broadening in scope as new chemicals are taking their places in manufacturing procedures. With greater knowledge not only being derived from the clinical laboratory, but also from case histories, the ultimate knowledge of effects of chemicals on the body should eventually be recorded. When this is accumulated, and even before, greater emphasis on safe handling of all chemicals should become part of the educational program for industry. Ideally all hazards should be eliminated, but until such a goal is reached first aid measures and adequate protection must continually be brought to the attention of every one who uses any type of chemical for any purpose.

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Amputation of the Leg

RAYMOND HOUSEHOLDER, M.D.,
Chicago

THE surgeon who assumes the responsibility of caring for the patient with a severely crushed leg is confronted with the problem of saving the patient's life and deciding whether the leg may be saved. The first problem involves the matter of control of hemorrhage, the prevention of or treatment for shock, relief from pain, and combatting the hazard of infection.

Quite frequently this patient enters the emergency room with some type of tourniquet applied as a first aid measure by someone at the scene of the accident. We wish to stress a word of caution concerning the injudicious use of the tourniquet and the damage that may follow. It is essential that hemorrhage be controlled by hemostats and ligature and the tourniquet removed as soon as possible.

Concerning the matter of shock, little more need be discussed here than to mention, in passing, the conservation of body heat, the relief of pain for which we are using adequate doses of morphine and scopolamine, and the use of suitable whole blood, plasma and other fluids intravenously as the condition may indicate.

To combat the hazard of infection we have found nothing better than meticulous thorough cleansing with soap or a detergent and sterile water and debridement, followed by the local use of sulfathiazole and the administration of penicillin intramuscularly or with parenteral fluids. Tetanus and gas bacillus antitoxin are given routinely in these cases.

With regard to the second problem it is the aim of the surgeon to preserve the injured leg as far as possible unless it endangers the patient's life or is unlikely to be of any more use. Experience and practice enable

Presented at the Annual Meeting of the American Association of Railway Surgeons, Chicago, October 21, 1946.

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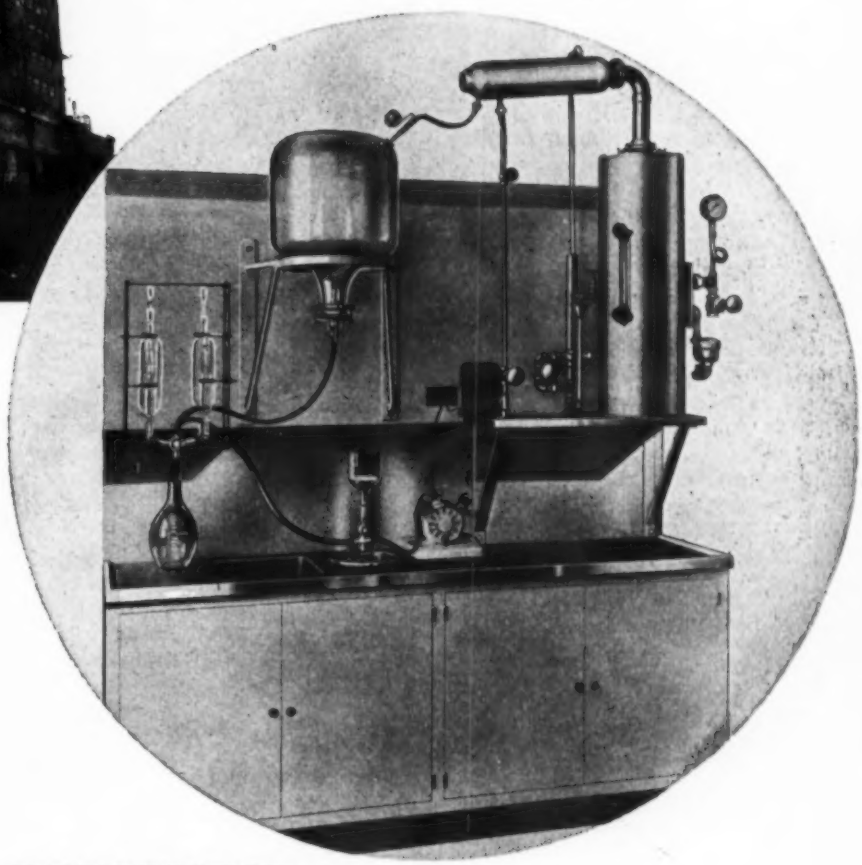

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the surgeon to distinguish accurately a leg that needs immediate amputation from one that can be treated conservatively. In deciding whether or not to remove a limb the main points to notice are its blood vessel, nervous and bony damage. It is usually not difficult to determine whether the damage is such as to render the leg non-viable, or even if viable whether conservative treatment will result in a long and difficult convalescence ending with a limb that has no useful function. Here we wish to stress the point of having x-ray studies of the injured member made immediately to serve as a permanent record of the extent of damage. These have their definite value in fortifying the surgeon's decision, and in possible subsequent medico-legal action.

When a decision has been reached that amputation is indicated, and the patient's general condition with regard to shock warrants operation, it has been our policy to proceed with a guillotine or open amputation at the lowest level consistent with a sufficient debridement of recognizable non-viable tissues. This type of amputation can be quickly executed under a general gas anesthesia. No attempt is made to close the end of the stump, but it is left open and sulfathiazole crystals liberally applied to the raw surface. Sterile vaseline gauze dressings are applied, and an immobilizing dressing of sterile Turkish bath towels. The patient is then hospitalized, a course of penicillin instituted, and the patient observed for the development of infection or other complications. This observation is continued until there is assurance that infection has not developed and the patient's general condition has improved so that he can endure further surgery. An amputation at the site of election is then done.

In planning this elective amputation of the leg the surgeon must remember that the stump will be useful to the patient only in so far as it is fit to carry an artificial limb. The length of the stump is important only in relation to the ease with which it will carry the prosthetic apparatus. A good leg stump should work as a lever; it should be long, but not too long, with a regular slightly conical shape. Any portion of a leg stump beyond the length necessary to carry the artificial limb is not only useless but may be harmful.

If the guillotine amputation has been made sufficiently low to allow freedom of choice for the final amputation level, a stump of from five to seven inches below the knee joint will be found to be most practical. However, we have many suitably shaped stumps much shorter, even as short as three inches that serve very well with an artificial appliance. The shortest length of tibia in our series is only one and a quarter inches long; nevertheless, this patient has full function of the knee joint and is working as a taxi-driver getting about rather efficiently with an artificial leg.

A blood pressure cuff tourniquet is applied about mid-thigh. The incision is made to produce a long anterior and a short posterior flap so that the scar will not be directly over the end of the stump. The flaps are so planned as to make the anterior flap twice as long as the posterior flap and the width of the flaps at their base one half the circumference of the leg at the level of the amputation. The deep fascia should always be included with the skin flaps so that the blood supply may be disturbed as little as possible. Such a wedge-shaped amount of the calf muscles is removed as will prevent a bulbous stump and produce a cone-shaped stump. All the soft tissues are separated from the bone to a point above the location where the saw cut is to be made. The periosteum is cut through with a sharp knife encircling the bone. It is well to scrape the periosteum distally from the knife cut so that in sawing there will be less likelihood of stripping up shreds of periosteum to be the source of bone spicule growth later. The crest of the tibia is cut away with an oblique saw cut. The bone margins are made smooth with a rongeur or coarse file. For a number of years we have made a practice of removing the entire fibula. Its removal lends toward making a better cone shape of the finished stump and obviates the frequent complaint of pain from pressure of the peroneal nerve between the neck of the fibula and the inside of the bucket or socket of the artificial appliance. The efficacy of this procedure is well testified to by a patient who had his first leg amputation as a young boy; the fibula was left in. Later in life it was necessary to amputate the other leg for Buerger's disease and the fibula was entirely removed. He found this stump so comfortable that he returned insisting on the removal of the fibula from his first amputation stump. This patient is now working every day and walking about very comfortably on two artificial legs. A word of caution should be made about the fibula removal. It should be carefully dissected out and not torn or ripped out forcefully and shreds of periosteum left. We wish to cite an example where such a procedure was done with resultant new bone formation and scarring and a painful stump. This scar and new bone formation had to be removed before the stump was made comfortable.

The large blood vessels are identified, extraneous tissue cleaned away and the arteries doubly ligated and transfixed. The nerves are simply cut short with a clean transverse cut with a sharp knife.

After the tourniquet is released all further bleeding points are ligated. The muscles are brought about and over the end of the bone with mattress sutures of catgut. Care is taken that these are not so tight as to strangulate the tissue. Over this the fascia is closed wih interrupted sutures of catgut. A rubber-tube drain is left down to the muscle. The skin is closed with interrupted or a combination of interrupted and continuous sutures of silk. Care is taken throughout that no tissues are sutured under tension, as undue tension hinders healing and may result in a slough.

Dressings are applied, held in place by a sterile towel, and a sterile bath towel and blanket splint are applied with the knee in extension.

We have followed this procedure for a number of years and have found it so satisfactory for furnishing the amputee with a comfortable and efficient stump that we recommend it to you.

WISCONSIN has been a leader in industrial safety practices, and we all can be proud of our record in this field. But when we begin to examine statistics on absenteeism in industry, we are rudely reminded that while our accident record is worthy of commendation, we have overlooked the greater importance of controlling the common cold, the Monday morning sense of fatigue and lowered vitality from excessive exposure of the sun during a 12-hour orgy of holiday golf or fishing. In our plant, which employs about 600 workers, we lost only 191 days from lost-time accidents in 1946. We feel mighty proud of this record, and enjoy the recognition given us by the Industrial Commission and our insurance carrier. But we blush when we note that during the same period our employees suffered 2,964½ days of total lost time due to illnesses alone—representing 65% of time loss from all causes. This means a loss to all of us—to management, a loss which has slowed up production; to our consuming public, delay in the delivery of essential farming machinery; and to our employees a loss of $33,000 in their pay envelopes. . . ."

From an Editorial "Can America Meet the Challenge," by W. D. JAMES, in *Wisconsin Med. J.*, March, 1947.

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Mass Immunization Against Influenza Types A & B

—In an Industrial Plant—

BERNARD S. DIGNAM, M.D.,
Plant Physician, Bigelow-Sanford Carpet Co., Inc.,
Thompsonville, Connecticut

WITH the development of the new combined influenza types A & B vaccine, a new weapon was given to physicians to prevent certain respiratory infections in man due to influenza virus A & B.

In a plant employing 3400 people, largely resident in one community, we attempted to test the efficacy of this new prophylactic measure this winter.

Vaccine Used in this Study

INFLUENZA vaccine was obtained from Sharpe & Dohme, and composed of equal parts of formalin inactivated types A & B virus proved to be the etiologic agents in various epidemics of clinical influenza. The use of vaccine was recommended by the Connecticut State Department of Health, as there was some suspicion of an impending epidemic of influenza.

Vaccination against types A & B influenza was evaluated clinically by the Commission on Influenza, Board for the Investigation and Control of Influenza and other Epidemic Diseases in the Army. The standard dose was 1 cc. administered subcutaneously in the upper left arm. An alternative method, described by the U. S. Navy Medical Department, was the injection of .1 cc. intradermally in left forearm. We used both methods.

Vaccination was on a voluntary basis; 2332 volunteered, and we started the early part of December 1946 and finished December 22, 1946 (about three weeks.) Our plant population at that time numbered 3400, so 68% of all employees were vaccinated.

With the help of a clerk, expediter and nurse, a schedule was laid out and all departments of the plant were visited where the vaccination was given by the physician. All volunteers, except those known to be sensitive to eggs, were vaccinated. Any individual thought to be allergic and the elderly were given .1 cc. As vaccinations continued, it was routine to give .1 cc. to those 60 years of age and over. At the time of inoculation four 5-grain acetylsalicylic acid tablets were given to every individual with instructions to take one every four hours if reactions such as headache, aches and fevers, and painful arm developed.

With the help of good teamwork, it was possible to do as many as 150 vaccinations an hour. The subcutaneous method could be done quicker than the intradermal, but with many tuberculin syringes available, it is possible to do the intradermal tests almost as speedily.

Of the total inoculated, 2332, 1624 were males and 708 were females. The age ranged from 16 to 75 in men and 16 to 72 in women. A total of 2332 consisted of 2116 subcutaneous doses and 216 intradermal. Many volunteers had previous immunizations against influenza in the Armed Forces.

Reactions

AS FAR as possible, every individual was checked the following day and 48 hours later, and in some cases a week later. We were unable to contact relatively few after vaccination. Every symptom or sign was counted once, whether the individual had one or more types of reactions. For instance, if an employee had a sore arm and headache, each was counted once. A table of reactions follows.

TABLE 1.
REACTIONS IN 2332—BOTH METHODS

Sore arm	193	8.2%
Aches and headaches	200	8.5%
Chills and fever	137	5.8%
Nausea and vomiting	41	1.7%
Total	571	24.2%
Out of work	23	.9%

Of the 23 out of work due to reaction, 20 were absent one day, and three were out two days. We believe our figures are quite accurate, as they were checked several times. It was felt that all of these reactions were probably organic except the gastric group which we thought in many instances were functional and psychological.

TABLE 2.
REACTIONS IN 216 INTRADERMAL .1 CC.

Sore arm	12	5.5%
Aches and headache	23	10.6%
Chills and fever	3	1.4%
Nausea and vomiting	4	1.8%
Total	42	19.3%
Out of work	2	.9%

It must be remembered in this group that the reactions in all cases were quite mild and the group consisted of those whom we suspected might be allergic or otherwise not in perfect health. In other words, the indication for this method was to reduce the number and severity of reactions from a full 1 cc. dosage. We feel that this group would have had more severe reactions with 1 cc. subcutaneously.

TABLE 3.
REACTIONS IN 2116 SUBCUTANEOUS 1 CC.

Sore arm	181	8.6%
Aches and headache	177	8.4%
Chills and fever	134	6.3%
Nausea and vomiting	37	1.7%
Total	529	25.0%
Out of work	21	.9%

This group, as was to be expected, ran a little higher per cent of reactions than the intradermal group. Local and general reactions were more severe in this group although it consisted of younger and possibly healthier individuals.

Reactions by sex were tabulated but not reported here, as there is no evidence that sex plays any part in reactions.

Titer Analysis

THROUGH the cooperation of the Connecticut State Department of Health and Dr. Eugene Lamoreux, Director of the Bureau of Preventable Diseases, antibody titers were done on bloods withdrawn on day of vaccination and three weeks later. Of the 60 done, 31 received intradermal .1 cc. and 29 received 1 cc. subcutaneously. We have no final report on titer levels, but those who had the intradermal tests show almost as high a protective level as the ones receiving 1 cc.

A group insurance sickness 100% coverage policy is held by all these employees and it will be possible to find out how much time is lost from influenza this winter. As we have had a mild winter, we think influenza will be of low incidence. To prove efficacy of vaccine, higher incidence of influenza should prevail in unvaccinated group of 1068.

Summary and Conclusions

TWO thousand three hundred and thirty-two employees of a carpet company volunteered and were given immunization against influenza type A & B in December 1946. In about three weeks it was possible

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for a good team to complete the task at specified hours. Both methods were used, viz., intradermal and subcutaneous. Reactions were less and milder in intradermal group than subcutaneous group. Our reactions were lower than some previously reported probably for several reasons: Aspirin was given which may have prevented some reactions and mitigated others. Small doses, .1 cc., were given to elderly, allergic and doubtful (physically) individuals. The servicemen, previously inoculated in the Army, who had reactions probably did *not* volunteer.

It was a worthwhile public health procedure, particularly valuable before an epidemic of influenza. It stimulated people of the community to ask family doctors for vaccination. It advertised health work in a community.

The titer reports, though higher in 1 cc. doses, are protective in .1 cc. doses and with the less and less severe reactions in the intradermal group, make the intradermal route the better of the two.

If the unvaccinated group has higher respiratory infection rate, particularly influenza this year, it is a definite valuable annual public health procedure for industrial medical departments and doctors in general to use on a wide scale.

References

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INDUSTRIAL HEALTH and DISEASE

Present Knowledge of the Relation of Nutrition to Dental Caries

Dental caries has plagued the human race for centuries but is still one of the least understood diseases, largely because dental teaching and research have concentrated on the repair of tooth decay rather than on its prevention. The concept that a relationship exists between diet and tooth decay has been widely accepted, but the more intimate details of this relation are not known. A large amount of opinion supports the concept that local conditions in the oral cavity constitute the controlling influence, but this simple concept neglects much data on the effect of variations in internal metabolism on the incidence and progress of carious lesions. In investigations on the effects of diet on tooth decay, the oral and systemic environments of the teeth should be considered. After eruption the oral environment of the teeth is a result of the salivary secretions, the oral flora, and the diet, while the digestive and assimilated portion of the diet controls the systemic environment of the teeth, and in addition may modify the type and quantity of the salivary secretions.

Numerous surveys of primitive races have shown that a change of diet so as to include foods of civilization results in an increase of caries. It has been assumed that an inadequate diet results from this change. Natural differences in native diets may also result in striking differences in caries incidence. For example, J. B. Orr and J. L. Gilks *(Med. Res. Council (Great Britain), Special Report Ser. no.* 155 *(1931))* made a survey of the health of two frican tribes, the Masai and the Kikuyu. The diet of the Masai consisted largely of milk, meat, and raw blood, while that of the Kikuyu was composed mainly of cereal with some roots and fruits. Of 254 Masai, 1.6% of the boys and 3.6% of the girls had carious lesions. Among the 2500 Kikuyus the incidence of carious lesions was 13.7% for the boys and 13.1% for the girls. Rickets was observed in 63% of the Kikuyu children but was said to be rare among the Masai. The effect of adequate diets upon the dental caries incidence in growing children has been

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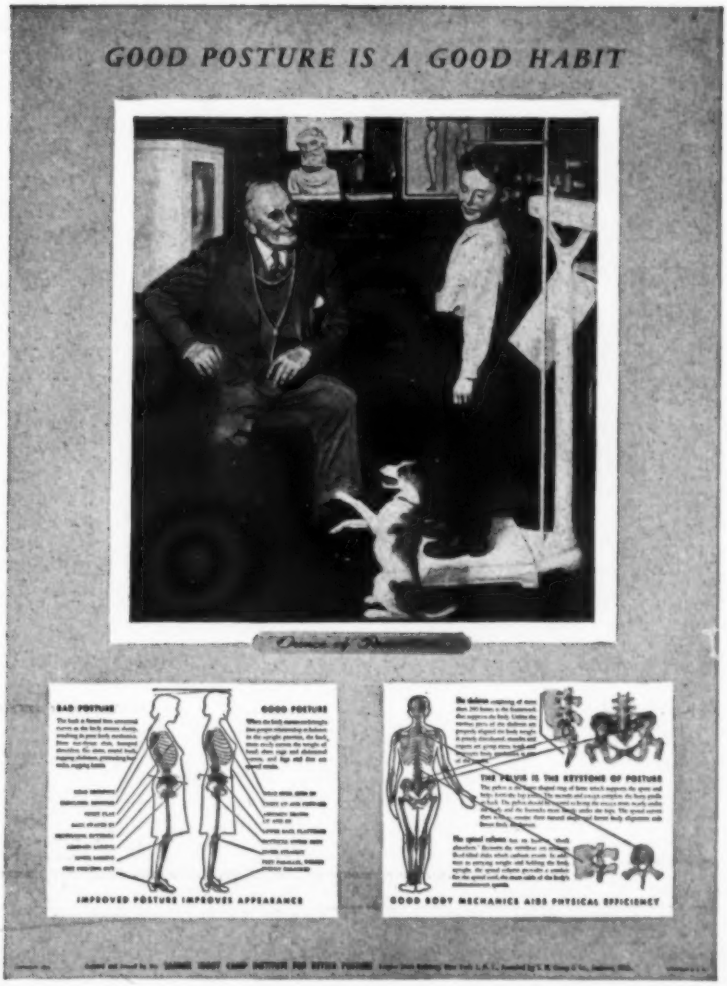
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investigated by J. D. Boyd and C. L. Drain *(Nutrition Reviews* 2: *35 (1944))* who observed a very low incidence of new carious lesions and an arrest of old lesions in diabetic children who had been maintained on excellent diets under strict supervision. The main constituents of the diet provided were: milk, cream, butter, eggs, meats, vegetables, and fruits, supplemented with adequate amounts of cod liver oil. The investigators postulated that the arrest of tooth decay was promoted by the correction of nutritional deficiencies. When an orphanage diet was supplemented with milk, butter, and eggs in sufficient amounts to make the diet adequate, an arrested or stationary dental caries activity was observed in 42 of the 53 children during the eight month observation period (C. L. Drain and J. D. Boyd, *J. Am. Dent. Assn.* 22: *155 (1935))*. In experiments to determine if recommendations to the mothers of outpatient children for the improvement of the children's diet would have any effect upon the dental caries incidence, P. R. Howe, R. L. White, and M. D. Elliott *(Ibid.* 29: *38 (1942))* and P. R. Howe, R. L. White, and M. Rabine *(Am. J. Dis. Child.* 46: *1045 (1933))* observed that there was a much lower incidence of new carious lesions in the children who were given dietary instructions than in those who were given no advice. Of the various nutrients, vitamin D has been most thoroughly investigated with regard to dental lesions. Lady M. Mellanby was one of the first to postulate a beneficial effect upon the addition of vitamin D to children's diets. Several of her early experiments were performed in the early 1920's when nutritional knowledge was very incomplete; since her early experimental regimens included variable factors in addition to vitamin D, interpretation of the results are difficult. In the latest and best controlled of Mellanby's studies, the effect of an olive oil supplement to the orphanage diet was compared with a supplement of olive oil which contained about 9000 units of irradiated ergosterol per day *(Med. Res. Council (Great Britain), Special Report. Ser. No.* 211 *(1936))*. The children in both groups were housed in the same institution and had the same environment. During the observation period of eighteen months, the group of children which received vitamin D had a significantly lower incidence of new carious lesions than the control group. Numerous other groups of investigators have tested the effect of vitamin D since the publication of Mellanby's original reports. The majority of these studies have confirmed the observations just mentioned; the most notable exception being the study of C. D. M. Day and H. J. Sedwick *(Dental Cosmos* 77: *442 (1935))* in which 40,000 units of vitamin D per day did not result in a decrease in the dental caries incidence below that in the control group. Such a massive dose actually may have been sufficiently toxic to disturb the calcium and phosphorus metabolism of the experimental group instead of improving it. The experimental data on the relation of vitamin D to tooth decay are strengthened again by survey data obtained in the United States on the relation of latitude and of annual hours of sunshine to the dental caries incidence. C. A. Mills *(J. Dent. Research* 16: *417 (1937))* found that there was an increase in caries experience with an increase in latitude of roughly 15 more decayed, missing, or filled teeth per 100 children for each added degree of latitude, which amounted to well over a 200% increase from the Gulf of Mexico to the Canadian border. B. R. East *(Am. J. Pub. Health* 29: *777 (1939))* has analyzed the relation between the annual hours of sunshine and the dental caries experience and observed a definite decrease in the caries experience with an increase in the amount of sunshine, with roughly a 4 to 5% decrease in the dental caries rate with each additional 100 hours of sunshine per year. Vitamin D would be expected to be beneficial through the maintenance of normal calcium and phosphorus metabolism. J. D. Boyd, C. L. Drain, and G. Stearns *(J. Biol. Chem.* 103: *327 (1933))* observed a statistically significant relationship between daily calcium and phosphorus retentions and dental caries activity with a lower retention of both in children with active dental caries. When the retention of calcium and phosphorus was improved by dietary means, there was a concurrent reduction in the dental caries activity (C. L. Drain and J. D. Boyd, *J. Am. Dent. Assn.* 22: *155 (1935))*. In contrast,

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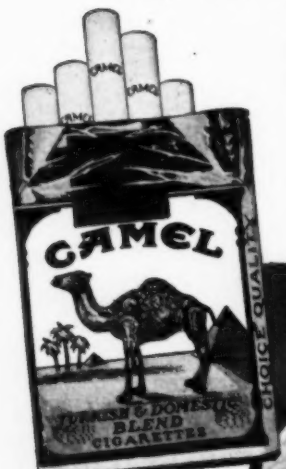

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E. H. Siegel, L. M. Waugh, and M. Karshan *(Am. J. Dis. Child.* 59: *19 (1940))* concluded from two day calcium and phosphorus balance trials made in three Eskimo communities that there was no relation between calcium and phosphorus retentions and dental caries activity. The large positive and negative retention values reported may be true observations for the two-day balance periods, but they could not exist for long periods without serious consequences. No conclusive evidence has been presented that other vitamins bear any special relation to caries incidence. Although vitamin A deficiency has a deleterious effect o nthe histodifferentiation of the odontogenic epithelium in the incisor of rodents, and ascorbic acid is essential for normal periodontal structures and calcification of dentin in the guinea pig *(Nutrition Reviews* 4: *41 (1946))*, the deficiency of these vitamins has not been demonstrated to have an effect on human dental caries. Caries incidence seems not to be elevated in deficiencies of the vitamin B-complex (A. H. Kniesner, A. W. Mann, and T. D. Spies *(J. Dent. Research* 21: *259 (1942))*, although the importance of the vitamin B-complex in maintenance of the soft oral structures is not to be overlooked *(Nutrition Reviews* 4: *(1946))*. Two reports on the effect of synthetic vitamin K in chewing gum on the incidence of tooth decay have been reported *(Nutrition Review* 4: *213 (1946))*. The conclusion of the one report indicated a positive relationship but the published data did not give strong support to the conclusion. The other investigation reported no relationship. Large supplements of synthetic vitamin K were found to be ineffective in reducing the incidence of various lesions in the white rat. Two interesting relationships have been observed between the public water supplies of various communities and the dental caries experience of the citizens. In regions where the drinking water is hard, there is a lower incidence of carious lesions than where the water is soft (C. A. Mills, *J. Dent. Research* 16: *417 (1937))*. Likewise where the drinking water contains one part per million of fluorine or above, the children consuming this water during the period of tooth development have a significantly lower incidence of carious lesions than those children who grew up in regions where the fluorine content of the drinking water was less than 1 p.p.m. *(Nutrition Reviews 1: 182 (1943))*. The effect of the addition of enough fluorine to a public water supply to make a total of 1 p.p.m. fluorine is being studied in Newburgh, N. Y. and in other cities to determine if this is a possible method for a partial mass control of dental caries *(Ibid.* 3: *115 (1945))*. Most studies of the effect of either the hardness of the drinking water supply or its fluorine content have been carried on independently of each other. One extensive survey in which the two factors were considered simultaneously has been described by T. Ockerse *(South African Med. J.* 18: *255 (1944))*. His data indicated that there is an inverse relationship between dental caries incidence and the hardness of the drinking water, independent of the fluorine content and likewise an inverse relationship between the dental caries incidence and the fluorine content of the water, independent of the hardness of the water. The effect of fluorine-containing waters has been found to be greatest during the perid of tooth development before eruption and in the maturation process shortly after eruption. This would indicate that the effect of the fluorine-containing waters was at least partially nutritional and could not be explained solely on the basis of the oral environmental contact with the teeth. The final test of the value of fluorine in reducing the incidence of tooth decay must await the results of those investigations where fluorine compounds are being added to different water supplies. The answer to the question of the possible toxic effects of the addition of 1 p.p.m. of fluorine to any public water supply will be obtained simultaneously. There has been much discussion of the possible role of sugar and other refined

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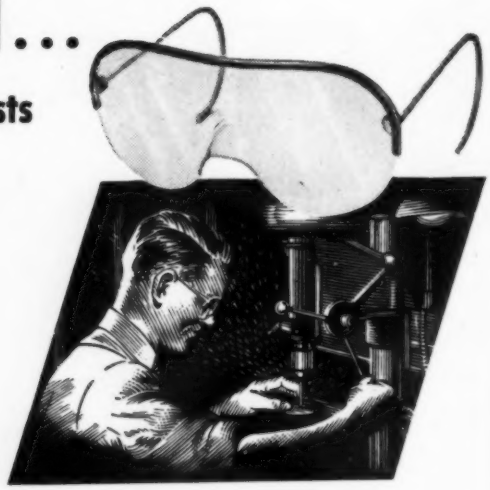

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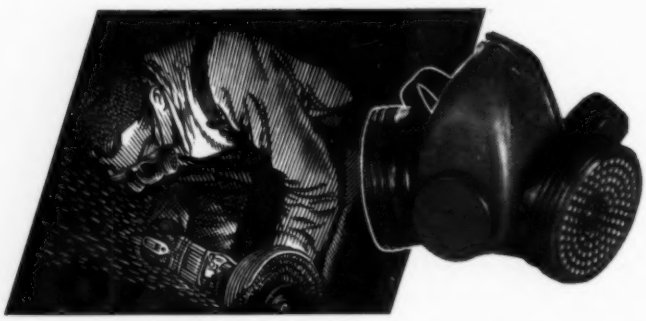

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carbohydrate foods in the production of dental caries. In the few recorded observations in which large quantities of sugar were incorporated into the fully adequate diet, J. D. Boyd, C. L. Drain, and M. V. Nelson *(Am. J. Dis. Child.* 38: *721 (1929))* did not observe any new carious lesions and those active at the beginning were arrested. It is noteworthy that these children received as high as 60% of their calories in the form of dextrose for a period of months. However, this diet contained no starch or cereals to hinder clearance of the soluble dextrose from the oral cavity. The experiment of M. Koehne, R. W. Bunting, and E. Morrell *(Ibid.* 48: 6 *(1934))* is frequently discussed as an example of the addition of sugar to an adequate diet. The authors reiterated the statement that the nutritional adequacy of the diet had been carefully maintained; however, it was stated that no vitamin D supplement was given during the eighteen month period of hospitalization. Evidence that the calcium and phosphorus metabolism of these children was not entirely normal was provided in the low calcium and phosphorus retentions recorded. Therefore the conclusion of Koehne and co-workers that the addition of sugar to an adequate diet had increased the susceptibility to dental caries cannot be justified in view of these data. The studies of Boyd and Drain which concerned the relation of an adequate diet to dental caries *(loc. cit.)* have been interpreted in terms of oral environmental effects by other investigators. The diet of Boyd and Drain was one which contained a low amount of carbohydrate since it had been designed primarily for the control of diabetes. Therefore oral environmentalists felt that the data obtained were manifestations of the low carbohydrate content of the diet and not of the adequacy of the diet. To test this hypothesis, J. D. Boyd *(Nutrition Reviews* 3: *160 (1945))* compared their original diet with one which offered only half as much fat and twice the amount of carbohydrate, without reducing the adequacy of the diet in other nutritional essentials. This study showed no constant or significant difference in the average rate of progression of carious lesions nor in the appearance of new lesions in the two groups of children maintained on the two diets for long periods. Therefore Boyd's conclusion was that the protection from acute carious lesions depended on the nutritive value of the diet rather than its carbohydrate-fat ratio. The relative effects of oral environment and of over-all nutritive value of a diet upon the dental caries incidence need much more thorough investigation, especially in so far as the sugar content of adequate diets is concerned. From a strictly nutritional standpoint, the value of adequate vitamin D and the maintenance of an adequate retention of calcium and

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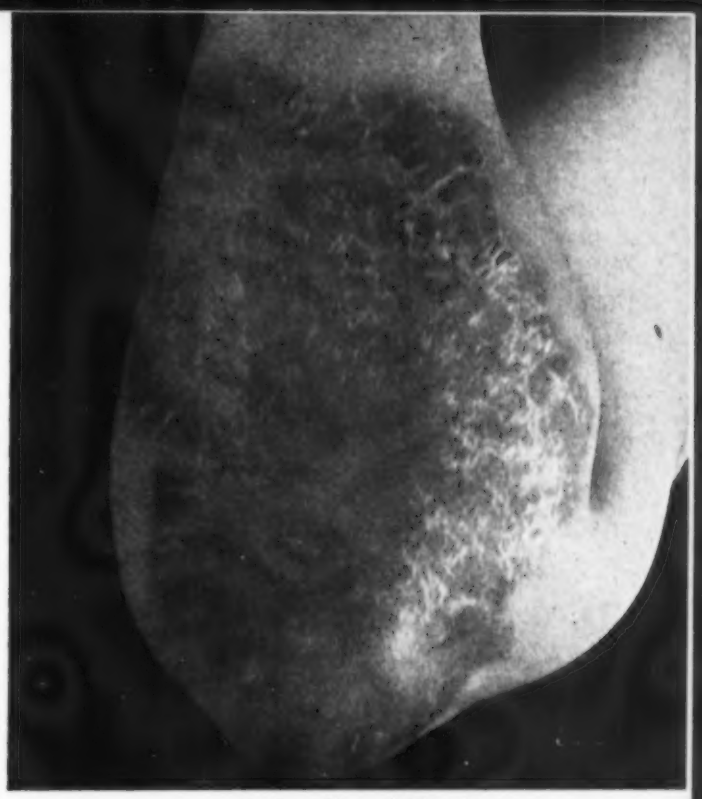

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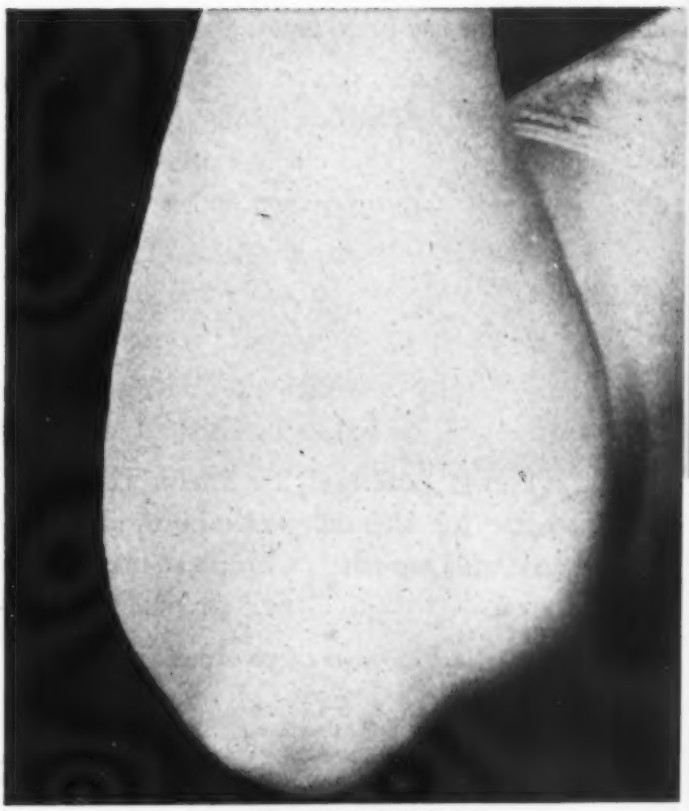

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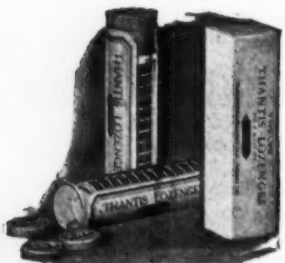

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phosphorus have been demonstrated to aid in the maintenance of a low incidence of tooth decay, even during periods of most rapid growth when metabolic demands are at their greatest levels. The fluorine content of drinking water may be another factor which influences dental caries incidence. Every effort should be made to apply these facts to nutritional programs with the knowledge that definite beneficial results on the dental caries incidence can be expected.

—*Nutrition Reviews*, March, 1947.

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Frequently, homologues of benzol such as toluol and xylol are found as contaminants in a reputed benzol mixture. At present toluol and xylol are not considered to be as toxic as benzol yet both should be handled carefully.

Benzol is a colorless, clear liquid with a characteristic pleasant odor in low concentrations and a disagreeable odor in higher concentrations. It boils at 80.1°C; has a specific gravity of 0.8787 at 15/4°C; solidifies at 5.5°C; has a refractive index of 1.5016 at 20°C and a flash point of 10-12°C. It is a highly inflammable substance, having a lower limit of inflammability of 1.4% and an upper limit of 6.8%. Its vapor density, air being 1, is 2.77.

Industrial benzol poisoning is caused almost exclusively by the inhalation of benzol vapor. Theoretically poisoning can also occur from an accidental ingestion of the liquid and through the repeated absorption of benzol through the skin.

Man absorbs 79 to 84% of the inhaled benzol if the air contains from 10 to 16 mg./liter (3000-5000 p.p.m.). It has been estimated that one-third of the benzol absorbed by man is excreted unchanged through the breathing. About 15 to 30% of the benzol absorbed is oxidized to phenol which is eliminated in the urine as alkylsulphuric acid, and also coupled with glycuronic acid. In the urine of workmen exposed to benzol, increased quantities of conjugated sulphuric acid have been noted. This sulphate response (decrease of percent of inorganic sulphates of total sulphates) occurs in exposed persons prior to anemia and leukopenia or other manifestations of poisoning and it tends to parallel the concentration of benzol in air. Hence the percentage of sulphate or sulphuric acid (inorganic) in the total sulphate of the urine of workers can serve as an indicator for the absorption of benzol vapors (not in determining the effect of benzol absorption).

A Bulletin of the State of New Jersey Department of Health, Division of Industrial Health, Vol. 1, Number 2.

Toxicology

LOCAL *Effect from Contact:* Benzol has a comparatively strong irritating effect on the skin and mucous membranes mainly through its fat-solvent action. 75% of benzol in olive oil used as a skin test on human skin causes blisters even on those who are not normally sensitive. The local irritating effect is also found in the respiratory passages — in cases of poisoning not due to inhalation, it is caused by the elimination of benzol unchanged through the respiratory passages. Irritation of lungs by benzol will cause the liberation of histamine which may lead to further complications, such as lung edema, and lung hemorrhages.

Systemic Effect after Absorption: The clinical types of benzol poisoning can be divided into the acute and the chronic intoxications. Each presents a different clinical picture.

1. *Acute:* The toxic effects of acute

A new antibacterial agent
for your most resistant cases of wound and
FURACIN
SOLUBLE DRESSING
Contains 0.2% Furacin (brand of nitro-furazone: 5-nitro-2-furaldehyde semi-carbazone) in a water-soluble base.
E.A.T.O.N. Inc.
NORWICH, NEW YORK

another of its several advantages:

THE WATER SOLUBILITY of all components of Furacin Soluble Dressing enables it to dissolve in blood, pus and serum, facilitating penetration to all parts of the lesion; permits its ready removal by irrigation with sterile saline.

Indications:

Infected surface wounds, or for the prevention of such infections
Infections of second and third degree burns
Carbuncles and abscesses after surgical intervention
Infected varicose ulcers
Infected superficial ulcers of diabetics
Impetigo of infants and adults
Treatment of skin-graft sites
Osteomyelitis associated with compound fractures
Secondary infections of dermatophytoses

E.A.T.O.N. Inc.
NORWICH, NEW YORK

benzol poisoning manifest themselves as an acute narcotic or anesthetic effect. This occurs very rarely in industry except accidentally. Exposure to high concentrations of benzol may prove rapidly fatal. In those acute poisoning cases which do not end in immediate death, the victim may recover promptly within a day or two. Occasionally some symptoms persist such as bronchitis, weakness, nausea and vomiting. In regard to the dosage required for acute poisoning, it is thought to be dependent upon the concentration of benzol and individual sensitivity, but primarily upon the degree of purity of the benzol. Very little data on toxic lethal limit for humans is available.

2. *Chronic:* Repeated inhalations of small quantities of benzol lead to chronic benzol poisoning which is of much greater industrial hygiene importance. Chronic benzol poisoning which is caused almost exclusively by the repeated inhalations of small quantities of benzol produces pathological changes in the blood and blood-forming organs. Quite small amounts can be effective in some susceptible individuals.

In spite of a great deal of research, the mechanism of chronic benzol poisoning is not clearly understood. However, the majority of contemporary investigators assume a simultaneous injury to the cells circulating in the blood, and upon the blood-forming organs.

The clinical picture of chronic benzol poisoning shows considerable variation depending on the intensity and duration of exposure. The inconstancy of other signs and symptoms has resulted in a concentration of attention on the blood picture since the effects of benzol upon the blood-forming tissue appear early as concrete quantitative and qualitative changes in the formed elements of the blood: namely:

(a) Leukopenia—*decrease in leucocytes (white blood cells):*

With poisoning caused by the continuous inhalation of benzol, the decrease in leucocytes is the chief laboratory sign. An irritation of the neutrophilic leucocytes might occur at first. This is a continuously progressive process and the neutrophilic leucocytes decrease constantly under the influence of benzol and will persist even after the absorption of benzol has ceased. Lymphocytes are attacked to a much less degree than the granulocytes and monocytes. Even with slight subjective complaints, one frequently finds a decrease in the neutrophiles with corresponding lymphocytosis often of a very high degree. The neutrophiles may decrease as much as 20% without the number of leucocytes being decreased at first, since the lymphocytes can undergo an absolute increase.

(b) Thrombopenia — *decrease in thrombocytes (blood platelets):*

The high sensitivity of thrombocytogenesis, the early appearance of hemorrhages in the skin and mucous membranes make it probable that thrombocytopenia is the earliest change. However, the technical difficulties of a blood platelet count and the wide range in the accepted normal limits (300,000 to 750,000) make this sign ill adapted for general use. The bleeding time and the coagulation time are found to be increased considerably in chronic benzol poisoning.

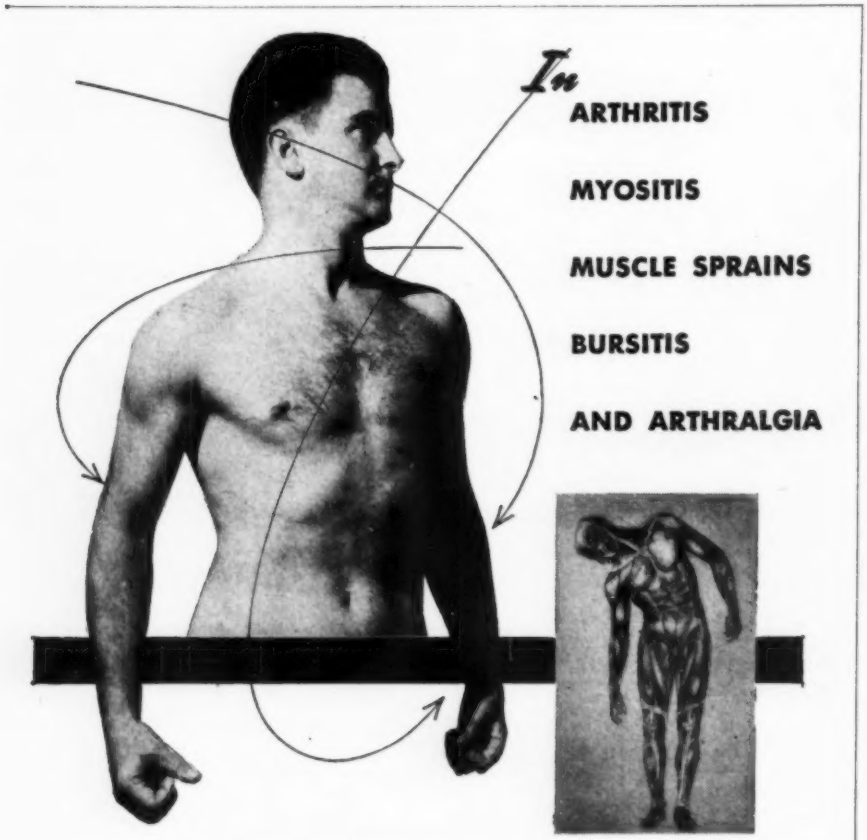
(c) Anemia—*decrease in red blood cells:*

In chronic benzol poisoning of humans, anemia occurs later than the change in the more sensitive white blood corpuscles, but the decrease in erythrocytes (*red blood cells*) frequently occurs to such an extent that death may ensue. This anemia is accompanied by anisocytoses, poikilocytosis, polychromasia, occasionally also by the appearance of nucleated red blood cells in the circulating blood. The color index is generally greater than one.

(d) Interrelated Changes—*inadequate immunity and altered ascorbic acid metabolism:*

Animal experimentations have substantiated the experience that severe chronic benzol poisoning frequently ends with a terminal sepsis in which all the protective mechanisms are lacking. It seems quite reasonable that a weakening in the capacity to resist infections is bound up with the great decrease in the number of neutrophiles. As yet, proof is lacking that serious septic infections and agranulocytoses are to be observed with particular frequency in persons endangered by benzol.

With workmen who showed signs of benzol injury, there has been noted a lowered ascorbic acid content in the blood. It is noteworthy that the low-



OBJECTIVE IMPROVEMENT may be achieved through the beneficial influences exerted on the pathologic processes by the active hyperemia induced by a Baume Bengué massage.

SUBJECTIVE IMPROVEMENT is evidenced by a comforting sensation of warmth and relief of pain which may result from the combined local and systemic effects of Baume Bengué.

Percutaneous absorption of methyl salicylate not only reinforces the topical effects of Baume Bengué but can enhance other systemic measures used to combat the underlying disease processes. The proof of the systemic effects of such preparations was established by the fundamental work of Moncorps, Kionka, Hanzlik, Brown and Scott.

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ANALGESIQUE

Baume Bengué provides 19.7% *methyl salicylate,* 14.4% *menthol in a specially prepared lanolin base.*

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ered blood ascorbic acid content corresponds to the degree of injury.

Control

ON THE basis of the classical blood picture of *chronic* benzol intoxication as seen in industry, a standard has been formed by the National Safety Council on Benzol for the diagnoses of benzol poisoning in industry and practical rules for its prevention have been made.

In the Final Report of the Committee of The National Safety Council in May of 1926 it was stated that:

"Any worker who on examination shows any of the following symptoms should be promptly excluded from benzol exposure:

(a) *Hemorrhages of mucous membrane of mouth, nose or other organs.*

(b) *Decrease of more than the following amount from the employee's normal blood picture (normal conditions will be obtained from previous examinations of the individual employee.)*

1. *White Cells, decrease of 25%; but in no case should an employee with a white cell count of less than 5,000 be continued in benzol processes.*
2. *Red Cells—decrease of 25%.*
3. *Hemoglobin—below 70%."*

However it should be mentioned here that chronic benzol poisonings often begin quite suddenly and that they often occur catastrophically as mass poisonings evidently brought about by certain changes in the industrial environment, or in the working methods. Individual susceptibility can't be determined in industry. Age or sex have no proven bearing on susceptibility although those individuals who are physiologically prone to hemorrhage, overweight individuals and pregnant women should not be exposed to benzol. Beyond this attention in the selection of the working force, the activity of the medical department should be directed to the variations in exposure and to the poisonous substance itself. The use of the word benzol and its homologues in labeling of trade products is inaccurate in many instances.

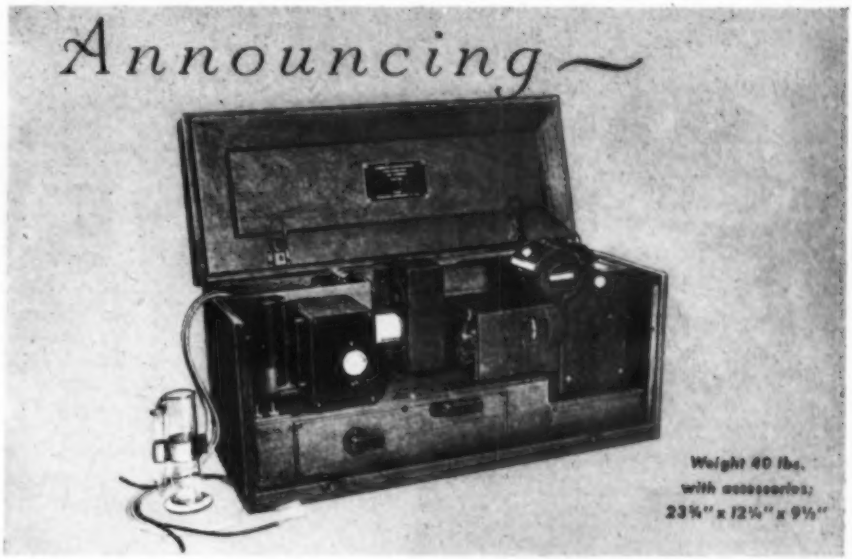
For the engineering control of benzol vapors it is necessary to first study the operations where benzol is being used for possible employee exposure.

The second phase of control is to evaluate the atmospheric concentrations. In this evaluation one of the two methods outlined below are used:

1. An air sample is pulled through a bubbler containing equal portions of concentrated sulphuric acid and fuming nitric acid and thus is nitrated to ni-denitrobenzene. The acid mixture is neutralized, extracted with one 10 ml. portion of butanone and then 1.5 ml. of 40% sodium hydroxide solution added to the butanone extract. A reddish-purple color develops, the intensity of which is proportional to the amount of ni-denitrobenzene present. A series of standards containing known amounts of ni-denitrobenzene are prepared simultaneously for comparison. This method is quite sensitive and for a concentration of 25 parts per million, it is only necessary to take a 500 ml. sample of the air.

2. A benzol combustible gas indicator is available which is capable of indicating 20 parts of benzol per million of air. This detector works on the principle of the Wheatstone bridge. By squeezing an aspirator bulb a sample of the atmosphere to be tested is drawn into the instrument. Combustion of the vapor on the surface of the detector filament results in the unbalancing of the electric circuit causing a deflection of the pointer of the meter proportional to the concentration of the benzol in the atmosphere being tested. The concentration of the gas may be read directly on the meter, which is graduated in 20 p.p.m. increments.

According to latest scientific concensus, the maximum allowable concentration, calculated on an eight-hour daily exposure basis, is 100 parts benzol per million parts of air. To assure oneself that the work-room atmosphere is being kept within safe limits, repeated check ups of the extent of air contamination are necessary. This work should only be done by personnel skilled in benzol detection methods and apparatus.



The New CAMBRIDGE PLETHYSMOGRAPH

BURCH-WINSOR TYPE

The Cambridge Plethysmograph records variations in the size of human extremities as determined by the state of fullness of the blood vessels. The instrument produces records which are standardized, quantitative and reproducible.

The extremity under investigation (finger, toe, etc.) is sealed in a plastic cup. This cup is connected by tubing to a highly sensitive metal capsule so that any variation in the volume of the extremity produces a corresponding extension or contraction of the capsule. Movement of the capsule is translated to a pointer arm, the shadow of which is projected onto the bromide paper of a photographic recorder.

These plethysmograms are standardized: 1 cubic millimeter change of volume per 5 cc. of volume of the extremity producing a deflection of 1.0 mm. on the record. Tracings made on all Cambridge Plethysmographs are therefore comparable; they can be read easily and interpreted directly without calculations.

Now in production, this new CAMBRIDGE instrument offers a sturdy, portable, and practical Plethysmograph for clinical and experimental purposes.

A 28-page paper, "A New Sensitive Portable Plethysmograph," by G. E. Burch, M. D. (Am. Heart J. 33: 48, January 1947), describes this instrument in detail. We shall be pleased to send one or more reprints of Dr. Burch's paper on request.

CAMBRIDGE INSTRUMENT COMPANY, INC., 3716 Grand Central Terminal, New York 17, N. Y.

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MAKERS ALSO OF THE CAMBRIDGE ELECTROKYMOGRAPH, CAMBRIDGE RESEARCH pH METER, CAMBRIDGE AMPLIFYING STETHOSCOPE, CAMBRIDGE BLOOD PRESSURE RECORDER, ETC.

Dialysis . . .

Determination of the osmotic pressure of SAL HEPATICA by dialysis demonstrates its "liquid bulk" action in the gut. Through the increase in fluid content, gentle pressure is exerted on the mucosal nerve terminii to stimulate normal peristalsis toward laxation or catharsis.

The desired action of this balanced saline can be easily controlled by the physician through proper regulation of dosage. Economical. Speedy, thorough action throughout the entire canal.

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When benzol readings exceed the accepted limit actual engineering control is necessary. If it is possible to use a non toxic material to replace the hazardous benzol this may be a simple way out of the difficulty. However, as there is no solvent to date which will compare with benzol in solvent properties, and which is neither toxic nor very flammable, the problem of substitution is not a simple one. If substitution is to be made the process should not be changed to counteract the substitution unless it is first ascertained that the new material plus the anticipated process changes will not produce conditions which will prove more hazardous.

Enclosing operations or covering any containers will prevent the escape of the vapor into the atmosphere. Where the use of open containers is unavoidable, special means of ventilation are necessary. The theory of operation in design and installation in all benzol ventilation problems is simply to take advantage of the natural tendency of this heavier than air solvent to collect at low levels and to allow these vapors to travel the shortest possible path from point to emanation to the point of exhaust.

On enclosed operations it is sometimes desirable to maintain a slight negative pressure on the enclosure. This will prevent leakage to the atmosphere from a process which may be only partially enclosed.

Homologues

THE number of deaths caused by xylol or toluol is very small in proportion to the widespread use of these substances in recent years. From the standpoint of industrial health, xylol and toluol are far less dangerous than benzol. We can't decide whether the less damaging effect is owing to the lessened evaporation or to the lesser toxicity of the same amount of vapor. The anesthetic effect of toluol and xylol is greater than that of benzol. Workers complain of irritation, headache, vertigo, sleeplessness, anorexia, palpitation and stomach troubles.

Medicolegal Aspects

IN DETERMINING the amount of temporary or permanent disability that a worker has incurred, there must be objective signs to substantiate the subjective symptoms. This should be true of all occupational disease disability awards. The symptoms should be those that we know from experience can be caused by benzol intoxication, and there must be signs, determined either by the physical examination or the laboratory examination, that substantiate the symptoms. More specifically, if the physical examination reveals persistent weakness, pallor, paralysis, small submucous or subcutaneous hemorrhages, or if the laboratory reveals a white cell count of below 5000 or a red cell count below 4,000,000 then the worker can be considered to be still disabled. This premise is predicated upon the fact that no other etiology exists for these signs.

In determining permanent disability, no judgment should be settled until at least two years after exposure, because the hemopoietic and the nervous system are notoriously slow in regenerating after injury. At that time a final rating may be given, taking into account the signs for evaluating the temporary disability.

MOST cases of venereal disease can be cured in a short time if they are treated early enough. Gonorrhea usually can be cured by one or more treatments given by a doctor, with little or no time lost from the job. Treatment for syphilis often can be completed in a hospital in less than two weeks. If you think you may have been exposed to a venereal disease through sexual relations with someone who might have the disease, go at once to a doctor and find out for sure. Most plant physicians are glad to give a blood test for syphilis and a physical examination and other tests for gonorrhea—and they will keep your name and the results confidential. Ask your plant physician, your own doctor, or your local health department."

—From "Facts about Syphilis and Gonorrhea," Workers' Health Series No. 10, U. S. Public Health Service.

"MOIST HEAT" IN HOME INJURIES

• WRENCHED MUSCLES • SPRAINS
• CONTUSIONS • BURSITIS

FOR those frequent injuries that occur in the home—the *moist heat* of an ANTIPHLOGISTINE pack brings immediate relief.

Instruct the patient to apply ANTIPHLOGISTINE comfortably hot—in order to ease the pain, reduce the swelling and promote healing.

ANTIPHLOGISTINE is a ready-to-use Medicated Poultice. It maintains *moist heat* for many hours.

Formula: Chemically pure Glycerine 45.000%, Iodine 0.01%, Boric Acid 0.1%, Salicylic Acid 0.02%, Oil of Wintergreen 0.002%, Oil of Peppermint 0.002%, Oil of Eucalyptus 0.002%, Kaolin Dehydrated 54.864%.

Antiphlogistine

The Denver Chemical Mfg. Co., Inc., New York 13, N. Y.

NEWS, COMMENT, OPINION

Eye Diagnosis

THE Allen Gonioscope, a new diagnostic instrument weighing less than one-tenth of an ounce, permits routine gonioscopic examination of the eye for thorough diagnosis, observation and planning of eye surgery. This device was developed by Bausch & Lomb Optical Company scientists from a design of Lee Allen, University of Iowa, overcoming a problem that confronted eye doctors for many years. Previously it was practically impossible to see into the part of the eye that is vital in diagnosing glaucoma, because light reflects from the "glassy" surface of the eye, obscuring the anterior portion. The instrument's small, precision optical prism held against the eye itself, re-directs the light and enables the doctor, aided by a slit lamp microscope, to see "around" the cornea, and into the channels where the disease occurs. The prism, mounted in a small plastic speculum, is rotatable so the entire corneal area may be easily examined.

Industrial Dentistry Text

ORAL MEDICINE," by Dr. Lester W. Burket, published by J. B. Lippincott, Philadelphia, contains one chapter on "Industrial Dentistry and Oral Manifestations of Occupational Origin" and also a section on "Oral Aspects of Aviation Medicine," by Alvin A. Goldhush, D.D.S. This text is the first to include chapters on Industrial Dentistry.

NEW
Pentothal Sodium Outfit
provides
completely closed technic
Developed to save time and simplify multiple administrations of Pentothal Sodium, the Johnson Outfit offers, for the first time, facilities for a completely closed method using the syringe, drip or a combination of both technics. By simply changing a short length of tube and the needle assembly, an entire day's schedule of administrations may be carried out without the usual loss of time involved in autoclaving preparation between patients. The equipment has been given exhaustive tests in hospital use.
Write now for complete information contained in a special circular explaining the new technic step by step and the complete equipment involved.
A. S. ALOE COMPANY
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City-Wide Chest X-Ray

THE biggest mass chest x-ray survey ever conducted among the civilian population of the United States is now under way in Milwaukee, as a part of the government's ever-increasing fight against tuberculosis, and other pulmonary diseases. Every one of the more than 600,000 citizens of Milwaukee is being offered a chest check-up during the survey, conducted by the U. S. Public Health Service, in cooperation with the Milwaukee Health Department and Tuberculosis Association. Such surveys to determine the incidence of disease have been carried on in other towns and cities, but this is the first time one has been undertaken in one of the country's largest metropolitan areas. The survey continues through April 15. Every citizen who wishes an X-ray check-up gives his name and address and voluntarily steps in front of the X-ray fluoroscopic screen to be photographed. The entire procedure takes only a few moments. If the physician examining the photographic negative detects signs of tuberculosis, the person is privately notified. By this simple method health departments have been able to discover scores of persons with early chest diseases in time for successful treatment.

Tribune Medical Service

THE extent to which employees of *The Chicago Tribune* take advantage of medical care and service provided for them by *The Tribune*, and the interest in employee welfare shown by the medical department, are illustrated in the annual report of the medical department for 1946, by DR. THEODORE R. VAN DELLEN, *Tribune* medical director. DR. JOHN MART, medical counselor, held 1,291 interviews during the year with employees who desired advice, 59 consultations regarding members of *Tribune* employees' families, and in addition checked 2,414 investigative reports. The *Tribune's* staff of nurses received 13,809 visits from employees for first aid, care, and advice. At the same time, the visiting nurse made 2,094 house calls on those who were confined to bed, under *The Tribune's* policy that the interest of the employer in the employee does not stop at the door of the office. The biggest function of the department is in treating minor injuries, disabilities, colds, and digestive up-sets. If their conditions warrant, employees may seek further advice from him or from their own physician. An even more important function in many instances is early diagnosis of what may become a dangerous illness. At least a dozen cases of acute appendicitis were diagnosed early by the medical department, preventing real danger to the sufferer. In the medical department, employees have a medical adviser available when they need

PICTURE QUIZ: Which of these five people gives the right reason for buying U.S. Bonds?

(ANSWER BELOW)

1. Easy to save! "I'm putting my money into U. S. Bonds because it's the *easiest way* for me to save. Under the Payroll Savings Plan, I put aside a regular amount each week for Bonds. So far, I've saved $500 without missing the money!"

2. Good investment! "Getting back $4 for every $3 I invest—the way I will in ten years' time with U. S. Bonds—is my idea of a *good investment*. I know it's safe and sound, too, because it's backed by Uncle Sam. Buy Bonds, I say."

3. Plans for the future! "Ten years from now, the money I'll get for my U.S. Bonds will help to send my kids to college, or buy our family a new home. I think that buying U. S. Bonds is the wisest thing a family man can do."

4. Fights inflation! "I want America to stay economically sound. That's why I'm putting all our extra dollars into U. S. Bonds. It's like buying a share in our country's future prosperity!"

5. Rainy day! "Maybe a rainy day's coming for me. Maybe it isn't. But I am taking no chances. That's why I'm buying all the U. S. Bonds I can through my Payroll Savings Plan."

THE ANSWER

Every one of these people gives the "right" reason—because there's more than one right reason for buying U. S. Bonds.

Whichever way you buy them—through Payroll Savings, or your local bank or post office—U.S. Bonds are the best investment you can make!

Save the easy way..buy your bonds through payroll savings

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THERE'S MORE THAN *Love* IN A LOVING CUP!

A common drinking facility can easily be the source of chain infection. Sanitary Lily Cups protect against oral-carried contagion —cost only a fraction of a penny each.

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BURNHAM SOLUBLE IODINE

For potent drug, "alterative" effects of iodine prescribe 15-20 drops t.i.d. in ½ glass of water before meals.
Send for sample and therapeutic suggestions.
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℞ DESITIN OINTMENT
The External Cod-Liver Oil Therapy

USED EFFECTIVELY IN THE TREATMENT OF
Wounds, Burns, Ulcers, especially of the Leg, Intertrigo, Eczema, Tropical Ulcer, also in the Care of Infants

Desitin Ointment contains Cod-Liver Oil, Zinc Oxide, Petrolatum, Lanum and Talcum. The Cod-Liver Oil, subjected to a special treatment which produces *stabilization* of the Vitamins A and D and of the unsaturated fatty acids, forms the active constituent of the Desitin Preparations. The first among cod-liver oil products to possess unlimited keeping qualities, Desitin, in its various combinations, has rapidly gained prominence in all parts of the globe.

Desitin Ointment is absolutely non-irritant; it acts as an antiphlogistic, allays pain and itching; it stimulates granulation, favors epithelialisation and smooth cicatrisation. Under a Desitin dressing, necrotic tissue is quickly cast off; the dressing does not adhere to the wound and may therefore be changed without causing pain and without interfering with granulations already formed; it is not liquefied by the heat of the body nor in any way decomposed by wound secretions, urine, exudation or excrements.

DESITIN POWDER

Indications: Minor Burns, Exanthema, Dermatitis, Care of Infants, Care of the Feet, Massage and Sport purposes.

Desitin Powder is saturated with cod-liver oil and does not therefore deprive the skin of its natural fat as dusting powders commonly do. Desitin Powder contains Cod-Liver Oil, (with the maximum amounts of Vitamins and unsaturated fatty acids) Zinc Oxide and Talcum.

Professional literature and samples for Physicians' trial will be gladly sent upon request.

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him, and can seek advice the moment it becomes necessary. DR. MART is a member of the faculty of Northwestern University Medical School, the medical staff of Passavant hospital, and the associate medical staff of Cook County hospital. Other work of the department during the year included the compilation of 2,823 confidential medical charts and 249 medical service histories. The staff made 156 laboratory tests, arranged 45 blood transfusions for *Tribune* employees and their families, and determined the blood type of 14 persons. A total of 1,352 investigations were made where private physicians were treating *Tribune* employees, and 742 investigations were made concerning employees without medical attendance. At the beginning of the influenza season *The Tribune* offered free to its employees a series of injections of influenza vaccine, in an effort to prevent outbreaks of illness during the winter. The number who received the vaccine was 1,101. "We will not know the results of this until the end of spring, but there have been some who were extremely ill with flu who did not take the vaccine. On the other hand, some who received the vaccine have developed symptoms of the flu, but in no case were the effects severe or disabling."

—*Chicago Tribune.*

DR. PILGRIM

—*Continued from page 6.*

on a coast-to-coast survey. . . . AND at a meeting of the Industrial Hygiene Subcommittee of the Chicago-Cook County Health Survey, at which were DRS. SLOBE, HOLMBLAD, PETERSON and FLINN, and MR. WARREN COOK—with discussion of important considerations implicit in the summary and conclusions of the industrial hygiene portion of the project. . . . AND engaged with editing and critical consideration of the final program for the Section on Preventive and Industrial Medicine and Public Health of the Centennial of the A.M.A., at Atlantic City, and impressed with the fine collection of speakers and subjects provided by the secretary, "RED" JOHNSTONE. . . . AND arranging for a trip to Cincinnati for investigation of a death alleged to have been caused by occupational disease; and for a plant inspection, and conferences with officials; and later a sojourn to Charleston, West Virginia, to address a health and safety group. . . . AND meanwhile reading the new book, "Forgotten Mysteries," enjoying the excursions into the supernormal which refresh one's memory of stories and experiments never to be forgotten in spite of the title. . . . AND interested in a biography of DR. CLIFFORD C. YOUNG, celebrated in Michigan for his great work in public health, and who said: "You can get anything done if you don't care who gets the credit for it."

Among the Milestones of Medical Advancement

The recognition that protein nutrition must be maintained in the presence of many pathologic conditions or states in which not so many years ago it was thought to be necessary to curtail the protein intake, may well be considered one of the milestones of medical advancement. In fact, today protein is recognized as one of the most important factors in the management of these very conditions.

In nephrosis with its high proteinuria and hypoalbuminemia, as well as in nephritis associated with albuminuria, a liberal protein regimen not only fulfills the purpose of "replacement therapy" to compensate for the loss of body protein, but also exerts a desirable diuretic action.

In cirrhosis of the liver, high-protein diet has brought about a miraculous change in the previously hopeless outlook.

In thyrotoxicosis, fear of an adverse influence of the high specific dynamic action of protein had led to restriction of protein intake. Evidence of a much lower specific dynamic action of protein in mixed diets than anticipated, and the necessity to correct the negative nitrogen balance, have led to the employment of high-protein diets with gratifying clinical results.

The former theory that protein exerted an adverse influence on the toxemias of pregnancy has been completely discredited. Evidence is piling up that a high protein diet in pregnancy may be a safeguard against toxemia.

Presurgically as well as postsurgically a diet rich in protein of high biologic value reduces the hazards of surgery and hastens wound healing and general recovery.

Among man's protein foods meat ranks high: (1) because its protein is of excellent biologic quality, providing all the important amino acids; (2) because of the percentage of protein contained; (3) because of its outstanding digestibility.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

ACCEPTED AMERICAN MEDICAL ASSN Council on Foods and Nutrition

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Relief...complete, prolonged... is the notable effect of this most widely prescribed vasoconstrictor. Three drops in each nostril, t.i.d., will do it—rapidly. Available in liquid or in new, convenient jelly form.

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